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MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

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OCTOBER 1991 VOLUME 119, NUMBER 10

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

ON THE COVER: *top left—the Canadair CL-215 fire-fighter, which can scoop up 800 to 1,500 gallons of water from a mile-long body of water without stopping. Top right—carbon-fiber rods. Middle right insets—Bill Price's Grumman HU-16B Albatross coming up onto step, and a close-up of a full-scale Canadair. Center—a Unionville Hobbies deHavilland Tiger Moth flies off floats. Bottom right—an Estes Cub with Bennett smoke system at Clearlake '91.*

FEATURES

HELICOPTER SECTION

CONSTRUCTION

COLUMNS

DEPARTMENTS

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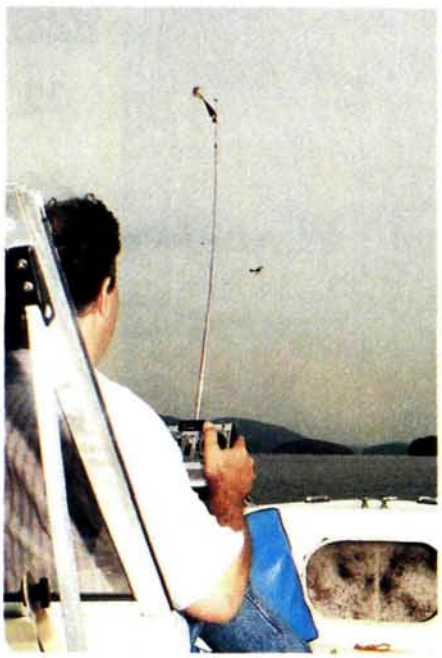
EDITORIAL

by TOM ATWOOD

WHAT COULD BE BETTER than flying off floats? How about float flying from a boat? For safety's sake, we located an area that was free of other boaters (the middle of a local lake, late in the afternoon, on an overcast day). Despite the tiny size of the airplane in the top photo, I'm flying a 100-inch-wingspan Florio Flyer Big Nifty carrying Balsa USA "Wave Ryder" 120-size floats. This was my first time float flying, and it was a tremendous kick to see the plane plowing through the water, rising up on step, and then rotating to take to the air. In the lower picture, *Model Airplane News* contributor and ace flier Dave Baron slowly backs the plane toward the boat as we cruise along the water. This gave us a unique vantage point from which to watch the plane's response to very small control inputs.



For those of you who'd like further information on the Schneider Cup Scale Re-Enactment: the next one will be held this year on November 1, 2 and 3 at Lake Havasu, AZ. To get more information on the program, you can contact Bob Martin, Schneider event chairman, at: 1520B Corona Dr., Lake Havasu City, AZ 86403; (602) 855-6900.

Looking back to issues of *Model Airplane News* in the '30s and '40s, you see a lot of discussion of full-scale airplanes as well as model aircraft design principles, aerodynamics, how to achieve stability for free-flight models, etc. Today, R/C models don't necessarily need the same degree of inherent stability because they can be trimmed in flight and are, in any case, controlled by the pilot. Still, the flight performance of many R/C models can be enhanced by tweaking the aircraft's design in various ways. Although many fliers just want to go to the field and chase their buddies around in the air, we see in our mail that many would like to know enough about aerodynamic design to customize models, or even to design original aircraft, for better performance.

In this issue, we start a series by Andy Lennon that will look at flaps (theory and practical construction), principles and techniques of low drag, and "stressed-skin" model aircraft design. The series will culminate in a construction article. If you want to see more of this type of coverage, please let us know.

We've received scores of entries in the Design Contest! We'll announce the finalists in an upcoming issue, and you'll help us choose the winners. ■

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

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Associate Publisher	YVONNE M. MICIK
Editor-in-Chief	TOM ATWOOD
Associate Editors	CHRIS CHIANELLI GERRY YARRISH
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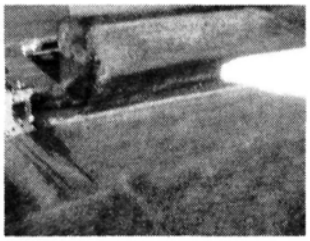
AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves." *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the writer's identity can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.



STURDY BIRDY SKY SPY

I've been reading your magazine for about a year now. My favorite sections are "Pilot Projects," "Hints and Kinks" and, of course, "Airwaves." The main reason I wrote is to tell you about the awesome aerial photographs that my friend Derek Holland and I took. We taped a small 110 Kodak camera to the fuselage of my Hobbico Sturdy Birdy just in front of the wing and mounted a servo on top of the wing. We took about 36 pictures, most of which were practice shots, but we were amazed to find that four of the pictures turned out perfectly, including a banking shot that included my friend and me. I'm only 15, and Derek is only 16, so I thought this was quite an achievement. The white structure in the middle of the picture is the wing.

In another project, we're adding twin engines and reshaping the nose of a low-wing trainer to make a B-25 Mitchell.

DANIEL WISE
Beebe, AR

Dan, we're impressed with your aerial shots and congratulate you and Derek on the achievement! Aerial photography is a lot of fun, and with today's miniature cameras, it's easier to accomplish than a lot of modelers might think. With the new, computerized video cameras and miniature transmitters, it's now possible to record video on board or transmit live video to a TV (look to future issues for more on this). When you finish the Mitchell, send us a

picture for "Pilots Projects"! *TA*

AWESOME AUCTION

Once again, as their Second Annual Auction of Warbirds and Vintage Aircraft approaches, the Museum of Flying in Santa Monica, CA, is conducting a worldwide search for aviation memorabilia. Items such as photographs, posters, model planes, period flight collectibles, souvenirs—even full-scale warbirds—are eagerly sought by the non-profit museum for the auction, to be held this year on October 5 and 6. Warbirds already consigned to this historic auction include: a B-17 bomber (one of only 10 B-17s left in the world); a totally restored B-25; a Catalina PBY-5A flying boat; a Douglas AD-5 Skyraider; an A-26 Invader; and Cary Grant's personal Convair, with its original executive interior.

Donations are tax deductible; items that don't go on museum display will be offered at the auction to provide funds for museum operations, further acquisitions and to underwrite the museum's ongoing educational programs for young people. If any of your readers has aviation memorabilia—(or a warbird!)—they'd like to donate to the Museum of Flying, please have them contact me at (213) 452-0999 or (800) 767-6660. Our Fax number is (213) 452-0773. Thanks for your support.

BRUCE REDDING
Auction Director
Santa Monica, CA

Thanks for letting us know about the auction, Bruce. I'm sure many readers will have an interest in visiting the auction, and I hope many will also have memorabilia to contribute. *TA*

TO FLY OR NOT TO FLY?

I'm a *MAN* enthusiast returning to model building after an absence of 40 years. The hobby has changed considerably. The P6E was a favorite airplane back in the early years.

I'm sending a few 8x10 color enlargements of my rendition of the P6E. I scratch-built this big, 1/6-scale bird from my own drawings. Power is an O.S.

(Continued on page 10)

AIRWAVES

(Continued from page 9)

90 Surpass, and the radio is a Futaba PCM. Made of conventional balsa and plywood, it weighs 8.5 pounds, and it has a wing loading of 19 ounces per square foot. I handcrafted all the parts, including the steerable tail wheel and the display propeller. The propeller hub was made out of PVC pipe, and the blades were carved out of walnut.

The bird should fly well, although I haven't had the courage to try, since I spent so many hours building it. I'm afraid that it will spend its life on top of the piano.

About 50 years ago, my twin brother and I built and operated a wind tunnel. *MAN* published our drawings and the construction article that we had written. With that wind tunnel, we did some important work on the Clark Y airfoil, particularly the study of wing slots. A few years later, we did our college thesis on airfoils. We studied the pressure distribution across a Jakowsky airfoil by theoretical, electrical and mechanical analysis. All this was before the days of computers and modern airfoil theory. I mention this in the event that you find it of interest for your "50 Years Ago" column.

W.G. CAST
Kentfield, CA

Mr. Kast, we're honored by your letter; we hope there are many others out there who, having read or contributed to this magazine decades ago, remain enthusiastic readers of Model Airplane News.

The P6E looks terrific. By the time this is printed, we hope it will have become an entry in our design contest, but that definitely would mean flight testing! We'll keep our eyes open for your wind-tunnel article for inclusion in our "50 Years Ago" column. Although many consider this to be the age of the ARF, we think that today, many modelers continue to share an interest in the theoretical aspects of model flight. We plan to offer more coverage in this vein. (Readers, let us know if you want to see a specific topic given priority.) Thanks for your letter, and keep us posted on future projects! TA

AIRBORNE ELECTRODE?

Two thoughts have occurred to me after reading your last two editorials. Let me applaud and encourage the turn or return to the basic design and the theory-and-practice articles on good design aerodynamics, power and prop selection, etc. At a time when hobby dollars have to be spent with caution, these articles are a good value for the price of a copy of *Model Airplane News*.

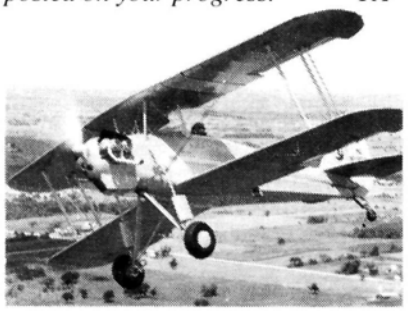
I still have my first copy (August, 1960) featuring a Tiger jet-powered F8U-1, the Willis Nye F4F Wildcat drawing, Björn Karlstrom three-views of the U-2 and the MiG-17, a basic free-flighter, a U/C trainer and lots more—a great mix and much like the philosophy I see in your pages nowadays.

One more thing: I'm trying to solve a problem and will share my answer with you, gratis, when I have it. Hah! One thing that's two things, like in Doctor Seuss! I'm trying to make ceramic molds to reproduce Kirtsite die aluminum surfaces, as my part in a north-south-east-west collaboration to come up with a 1/5-scale F4B-4/P-12E. This is happening. The second part of these experiments is to come up with true, scale, corrugated skin material, most likely thin ABS. I'm meeting with a honcho of a thermoplastic fabrication outfit to try to enlist some of his expertise. If I get this one licked, we can whip up a better Ford Trimotor than the 1929 *MAN* plan. My brother and I have promised our-

selves an electric Ford when the foil batteries come along, and it's conceivable that we could corrugate the foil and make the whole model a battery! Mr. Packard (Cleveland Model) says he hopes he lives to see it. I do, too.

DAN CAHILL
Glen Head, NY

Dan, thank you for your comments on the magazine. We're making an effort to diversify our coverage and increase the number of practical how-to articles, among other things. (Readers with construction methods, how-to ideas, etc., don't hesitate to let us know if you'd like to share your modeling insights with the rest of our readership; you can help us improve the magazine.) Dan, we eagerly await the fruits of your R&D efforts on the scale F4B and the all-electric Ford Tri-Motor! Please keep us posted on your progress! TA



COVER COYOTE?

I'm writing to you regarding the home-built featured on the cover of the April '87 issue. I believe they called it the "Coyote." I'd like to build a 1/4-scale model of it for next year's WRAM show. Do you have any information as to where I can get plans or a three-view? I've been building models for over 50 years and still have some of your magazines from the '30s. I was also a member of the old IGMAA started by *MAN* editor Charles Grant. By the way, a recent article in your magazine was written by an old friend of mine, Dick Purdy. We grew up together. He flew for the Navy; I flew for the RAF and later for the USAF. Give him my regards.

FRED A. BANGE
Briarcliff, NY

Fred, the aircraft on the April '87 cover wasn't the Coyote but, rather, the Skyote, an experimental home-built biplane that was designed by Pete Bartoe of Clark, CO. For more information on the real airplane, contact Skyote Aero Marine, P.O. Box 808, Clark, CO 80428. Phone: (303) 879-3823.

We called Pete and found that a very accurate model plan set is available from Duane Burnett, 2260 Mariposa, Boulder, CO 80302. Write to him for further information. The plan is for a rubber-powered version, but it could be enlarged for R/C use. We hope you build an R/C version and send us a photo for "Pilots' Projects." If you create an original design, perhaps you could write a construction article for us. Good luck! GY ■

FIFTY YEARS AGO

NAVY TOUGH GUY

by GERRY YARRISH

IF FIGHTERS are the "fast guys" and heavy bombers are the "big boys," then dive bombers must be considered the "tough guys." As described in an article entitled "Navy Tough Guy" in our October 1941 issue, the mission for both the machine and its pilot was a grueling one.

"...[The pilot] is well above 15,000 feet...Over on his back, then down on his nose, and the straight, screeching, gut-busting power dive: *seventy degrees* toward the ground at 500mph!" The pilot needed 2,500 feet of altitude to pull the plane out of its dive, so the bombs were usually released at 5,000 feet. After the pilot had made sure that his bombs had been released, he started to pull back on the stick and put himself and the machine through a kind of torture. The G-forces generated from the change in direction slowly drained the blood from the pilot's head and forced it into his lower extremities. The first thing affected was his sight, and his field of view dimmed."...He can hear nothing, feel nothing but that great searing pain in his lower abdomen." As the forces continued, the condition worsened.

The airframe, too, reacted to these tremendous stresses, and dramatic structural failures sometimes occurred. Rivets popped, formers cracked and skin panels sometimes buckled. On the verge of unconsciousness, the pilot released stick pressure by a mere inch and felt the pressure in his gut decrease and the faintness subside. At about 2,300 feet, the roller-coaster ride bottomed out and the plane started to climb again; at 10,000 feet, the pilot pushed the nose over again into level flight and thanked his training, his aircraft and his lucky stars that the maneuver had been completed. Target destroyed; time to return to base.

BREWSTER BOMBER

The plane shown on the October 1941 cover of *Model Airplane News* is the Brewster dive bomber 340 (designated XSB2A-1). It was designed for the mission described, and we called it the "Navy Tough Guy."

The Brewster 340 was a two-seat, long-range, scout dive bomber that had an all-metal monocoupe fuselage. Its wings were very strong and employed a single-box main spar that was stronger than most double-spar designs of the time. Its wingspan measured 45 feet, 7 inches, and its overall length was 31 feet, 4 inches. Originally equipped with the Wright Cyclone 750hp radial, production versions were powered by the Wright double-row, 14-cylinder 1,700hp radial. This increased the plane's top speed at 17,000 feet from 302mph to 325mph, and it greatly improved its climb rate. The plane was armed with two 50-caliber guns (one in each wing), and a 37mm cannon in a powered turret aft of the rear canopy. By all standards, the Brewster 340 lived up to our name for it.

The Brewster's design seems to be a great platform for an R/C model. It has a generous wing and tail area, its nose moment is long enough for good CG location, and it's an unusual, infrequently modeled aircraft. We've included the three-views that were published in the October '41 issue. We hope that you'll find it interesting enough to build your own version of this Navy Tough Guy. ■

The Brewster 340 was an all-metal, two-place, long-range scout dive bomber. This plane was designed to complete tough jobs, and it would be a great modeling subject.

AIR SCOOP

by CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find news that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

Bunny Birds

"Project Starlet" is the latest Japanese solution to the SAM (surface-to-air missile) threat, and it's being tested in model form. Simply put, the design calls for a new breed of aircraft that splits in half when it's threatened by a SAM. The program was going quite well until the Japanese Air Force ran into a stone wall when they tried to sign up test pilots for the full-scale version: 50-50 odds aren't overly attractive, I guess!

A new design calls for the aircraft to split in four, with the hope that the increased odds will attract trainees. While they're waiting for delivery of the new Starlet II (the one that splits in four), interim tests will be done by strapping two Starlet I's together. This stage of the program will be called "Operation Bunny Birds." It makes sense: two go up; four come down!

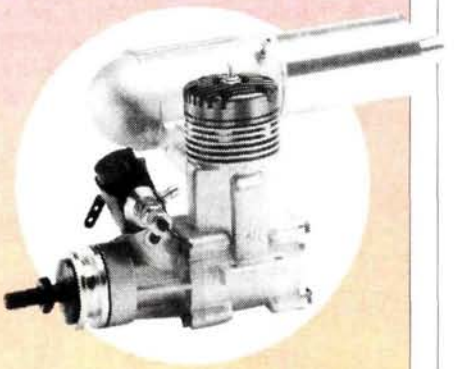
ZOOM WHILE YOU ZOOM

Here, Japan's own Hiroshi Fukaya displays his solution to one-man home videos. This wild inventor's creations, however, only begin here. Not only will we be featuring the construction of his "vid-o-mitter," but Hiroshi is also perfecting an inexpensive model-airplane construction method that uses pliable foam sheet. He's already flight-tested his electric versions of a BD-5, a P-51 and a T-33, and we've seen the results as recorded on the "vid-o-mitter"—not bad! Here's an example of Mr. Fukaya's resourcefulness: to fabricate home canopies, he pours hot water over jumbo clear shrink-tubing that's laid over a plug—very clever!

NO LOSS

AstroFlight claims that their new Zero-Loss connectors do just that: they provide zero loss when they're used with 14-gauge wire. They're designed for 100 amps peak and 50 amps continuous, and they're suitable for Astro motors from an .05 to a .40 Cobalt. The hyperboloid sleeve sockets are

Quite Quiet



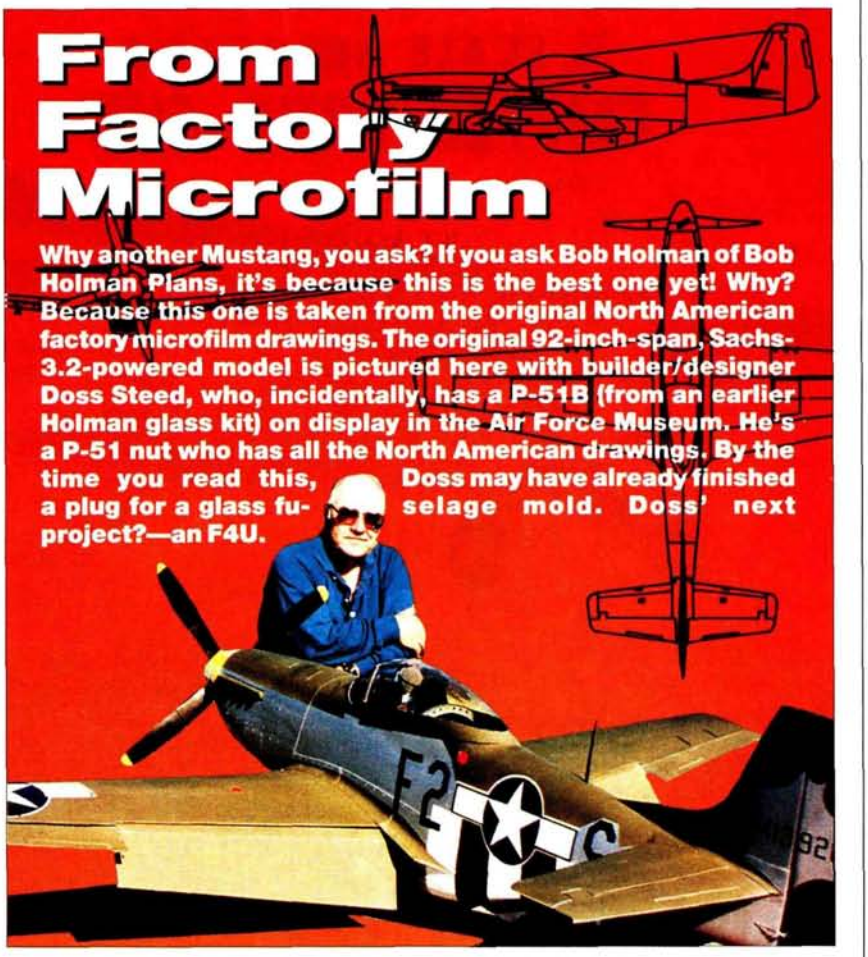
For two years, Irvine has been working on what they call the "Quiet" concept, which has culminated in the new Irvine Q40. It's an 8-port sport engine with a torque curve that peaks at very low rpm and has the ability to swing props that are larger than those used on a normal .40 engine. For example, with APC 11x7 or 10x9 props, the engine will turn an admirable 11,200rpm and remain amazingly quiet (according to the manufacturer). Couple this low-end torque engine with Irvine's new silencer that maintains low-end power with no rpm loss, and you have one quiet engine. Unfortunately, its availability in the U.S. is uncertain, but I hope that changes. *We need engines like this!!*

made of Astraloy 174® copper alloy, which is as strong as mild steel and has the conductivity of copper. The Zero-Loss connectors are made in the USA, and they're plated with 50 microns of pure gold. According to Astro Bobby, they've been tested to military standards for 100,000 insertion cycles without any measurable degradation.

MIDNIGHT MANEUVER

It has been said that genius sees the simple solution while others are caught up in complexity. After seeing Hirobo's Cyclic Practice Plate, I accept that statement as an axiom. The path that the little chrome ball takes is the path that the helicopter will take. What more can I say?—except that you can now practice anytime, even at midnight in midwinter.

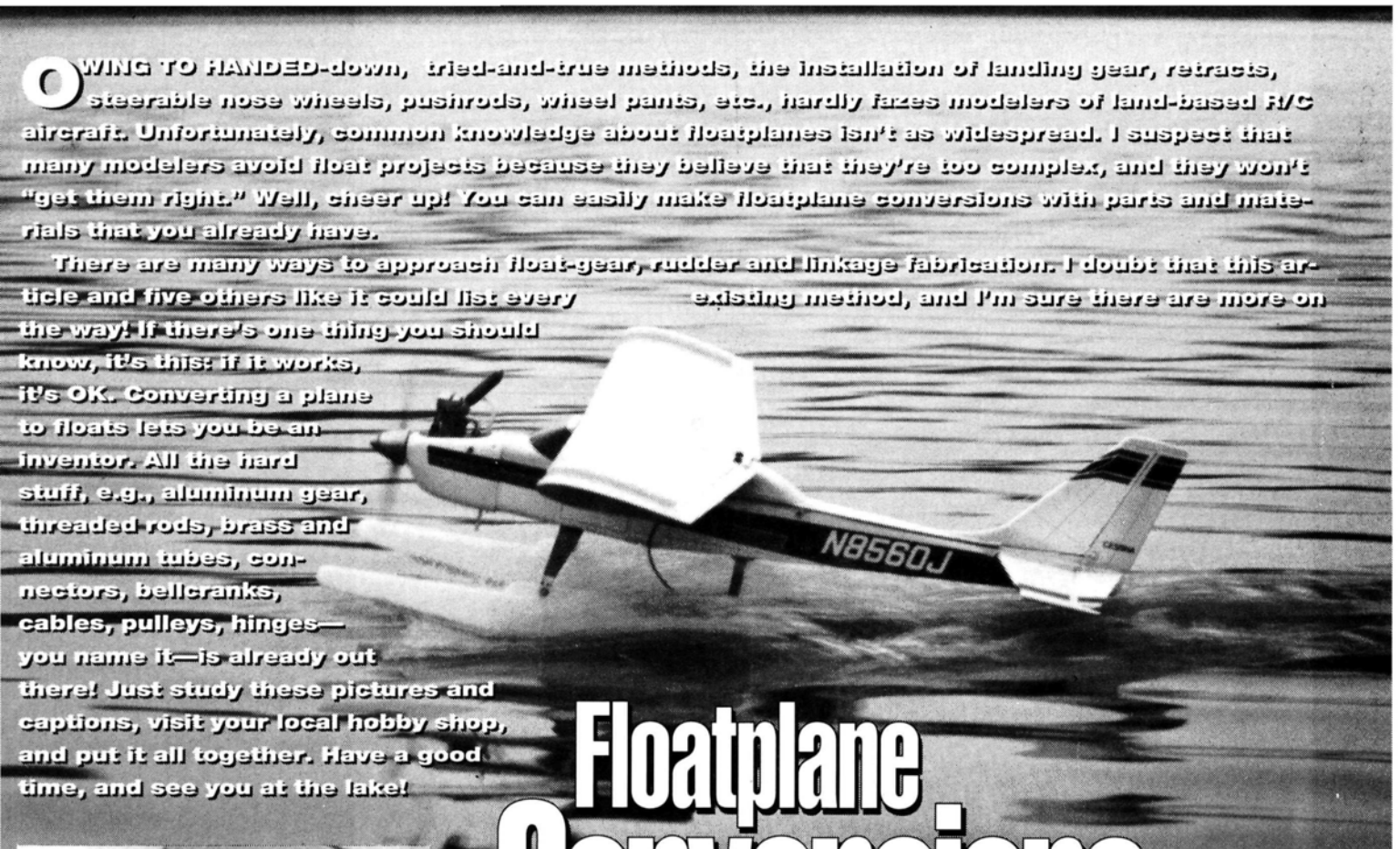
From Factory Microfilm



Why another Mustang, you ask? If you ask Bob Holman of Bob Holman Plans, it's because this is the best one yet! Why? Because this one is taken from the original North American factory microfilm drawings. The original 92-inch-span, Sachs-3.2-powered model is pictured here with builder/designer Doss Steed, who, incidentally, has a P-51B (from an earlier Holman glass kit) on display in the Air Force Museum. He's a P-51 nut who has all the North American drawings. By the time you read this, Doss may have already finished a plug for a glass fuselage mold. Doss' next project?—an F4U.

OWING TO HANDED-down, tried-and-true methods, the installation of landing gear, retracts, steerable nose wheels, pushrods, wheel pants, etc., hardly fazes modelers of land-based R/C aircraft. Unfortunately, common knowledge about floatplanes isn't as widespread. I suspect that many modelers avoid float projects because they believe that they're too complex, and they won't "get them right." Well, cheer up! You can easily make floatplane conversions with parts and materials that you already have.

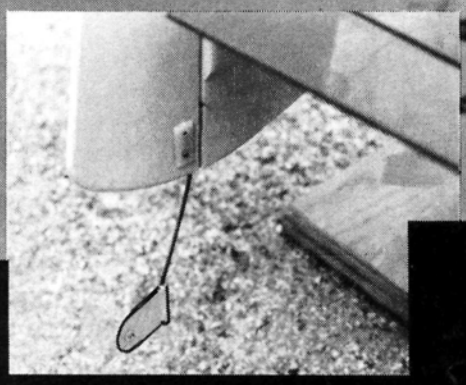
There are many ways to approach float-gear, rudder and linkage fabrication. I doubt that this article and five others like it could list every existing method, and I'm sure there are more on the way! If there's one thing you should know, it's this: if it works, it's OK. Converting a plane to floats lets you be an inventor. All the hard stuff, e.g., aluminum gear, threaded rods, brass and aluminum tubes, connectors, bellcranks, cables, pulleys, hinges—you name it—is already out there! Just study these pictures and captions, visit your local hobby shop, and put it all together. Have a good time, and see you at the lake!



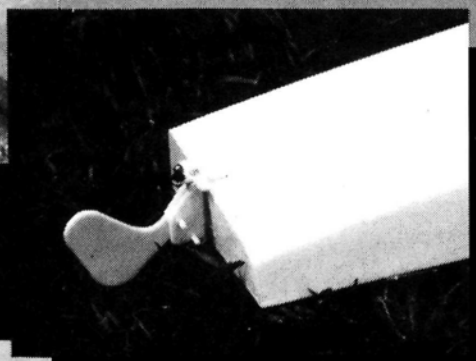
Floatplane Conversions and Gear

Simple solutions with handy hardware

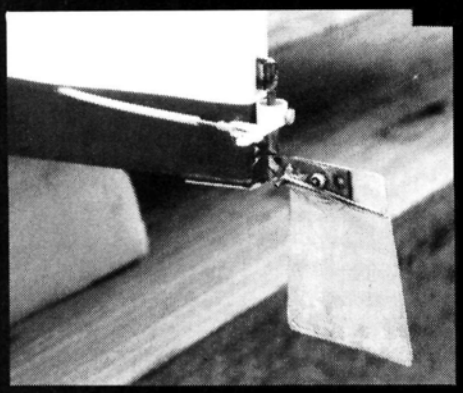
by JOHN SULLIVAN



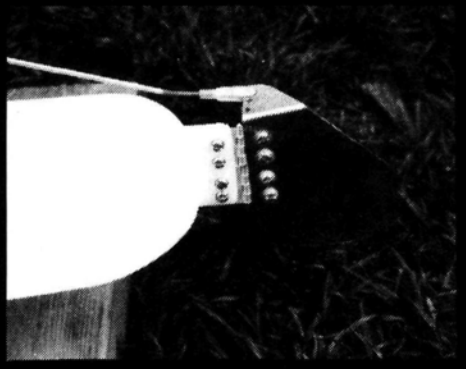
▲ A water rudder driven directly off the air rudder can be very effective. This one has been clamped to the air rudder with the nylon rudder-control horn, wrapped around the music-wire down shaft and soldered.



▲ This Williams Brothers rudder is one of the few commercially available units. Its size restricts it to use on .20- and .40- size models. Although disconnected, the ball link suggests that this rudder was slave driven from the opposite float.

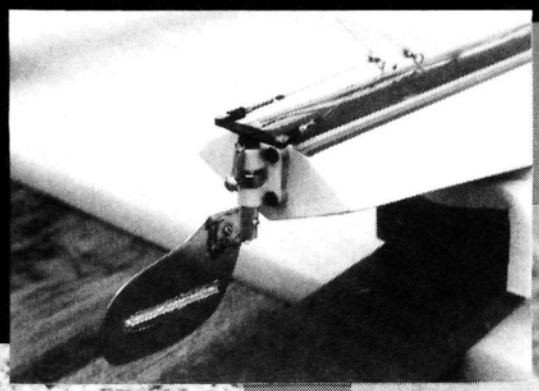


▲ A pushrod exiting the hull drives a bushed-nose wheel arm. This soldered metal rudder uses a rubber band stretched around pins to provide a kick-up/return action. All the work shown here can be done with tin snips, a drill, a Zona saw. and a soldering iron.



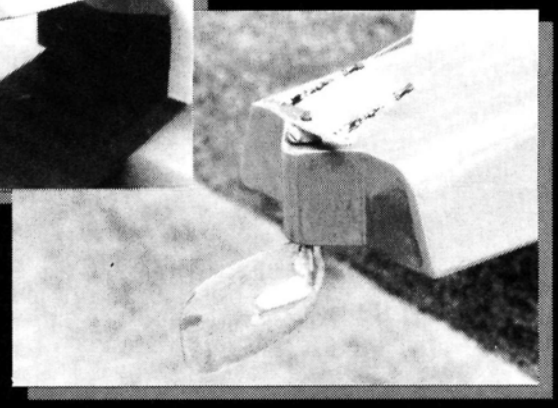
◀ A pair of nylon hinges was bolted to the stern tab on a Gee Bee float, and the rudder was bent on top to form a control horn. This water rudder is driven by solid pushrods off the air rudder, with a bellcrank for reverse.

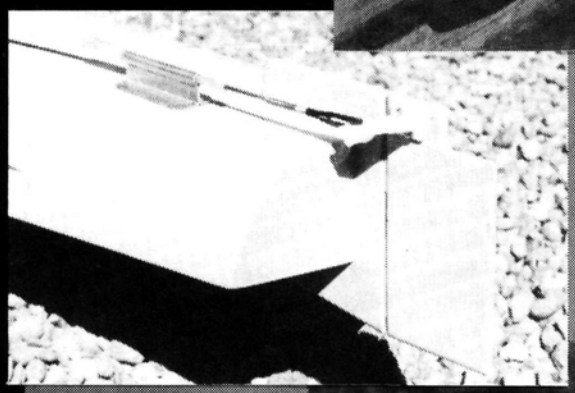
Floatplane Conversions and Gear



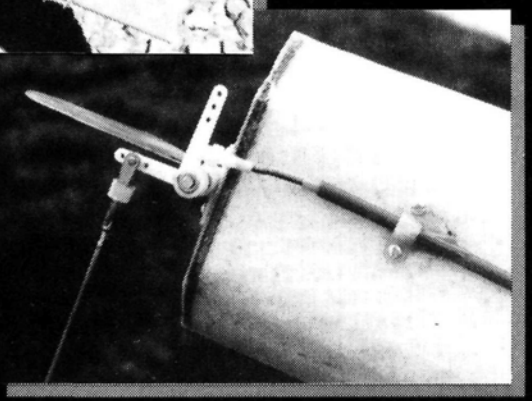
▶ The pull/pull arm appears to be splined to the rudder post and held in place with a spring connected to a long, wheel-collar set-screw. The rudder plate has been stiffened with a short length of music wire soldered to the plate, and a rubber stern gasket prevents water from seeping in around the screws.

▼ A V-shaped stern block houses a brass tube for this system's rudder shaft, which is bent at the bottom and soldered to the rudder plate. The sheet-metal pull/pull arm was soldered to a wheel collar. The rudder can take a fair amount of abuse without failing, yet it's not overbuilt or heavy.

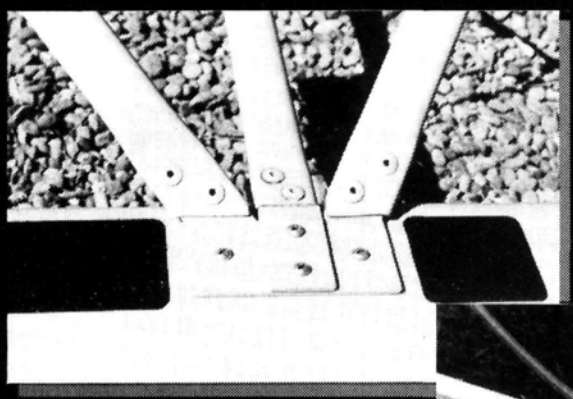




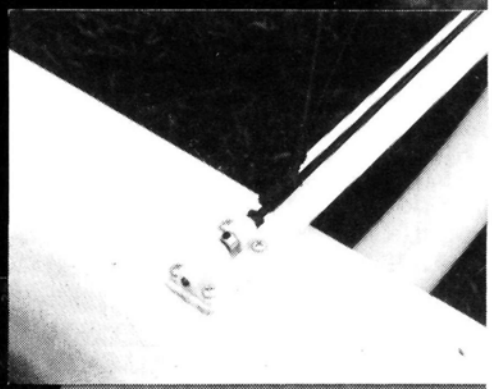
▲ To build a rudder quickly, laminate two pieces of 1/16-inch ply over EZ hinges. The bottom forward skeg blends into the float bottom so that it won't catch on weeds. Plans for six sizes of this type of rudder are available from Model Airplane News (plan no. FSP10893).

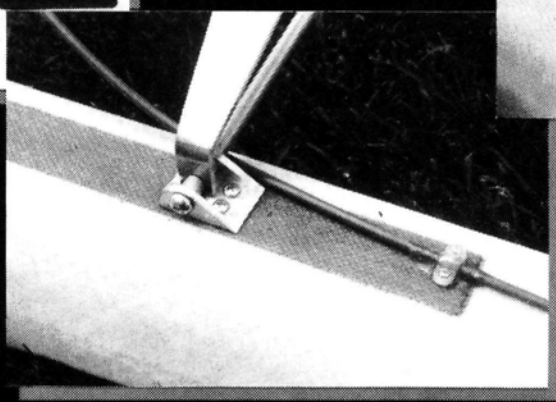


◀ The drive side of this slave rudder system uses two nose-wheel arms to form an adjustable bellcrank. Pushrods crossing from stern to stern, as these do, don't seem to get swamped by spray. The rigid, nylon hold-down clip that's screwed into the fiberglass on the stern deck does the job.



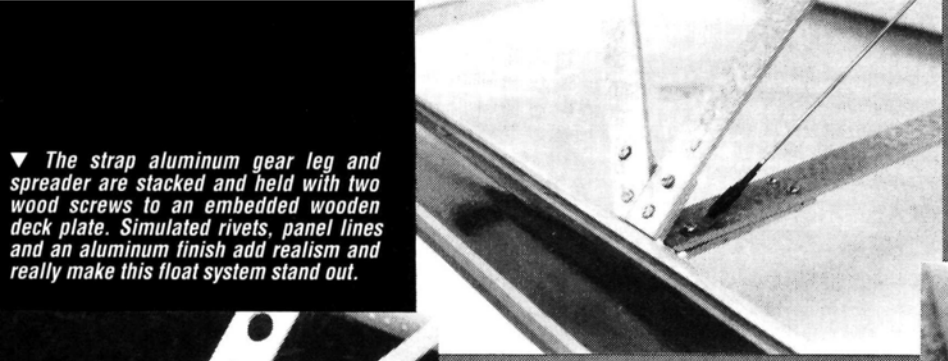
◀ Flattened Proctor tubes were pop-riveted to aluminum tab plates to complete this "N" strut/spreader bar juncture. This is a clean, light and sturdy system. Black, non-skid bathtub tape was used for the deck walk material.





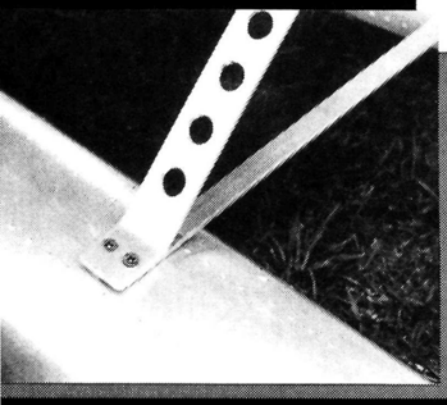
▶ The deck foot on this system was made out of stock aluminum channel. The spreader bar is actually heavy aluminum tube that has been threaded internally on the ends with drilled-through sections as spacers. A round-head machine bolt holds it all together, and four Phillips-head wood screws secure the foot to the deck. Notice the pushrod hold-down.

▲ A nose-wheel block was used to secure music-wire gear in this setup. A flat wooden spreader is trapped under the gear system to limit float twisting. Many modelers elect to test their systems before completely filling and finishing the floats, and that explains the pinholes and bare glassed surfaces on a few of our subjects.

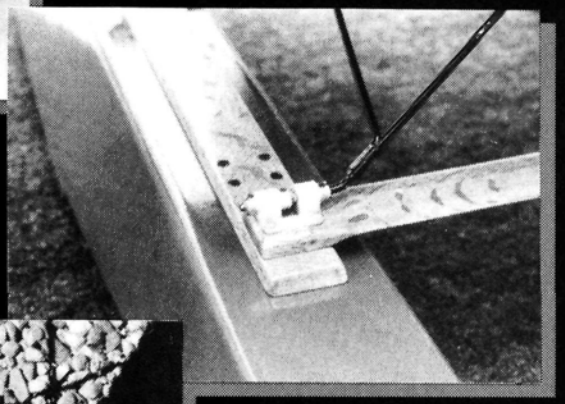


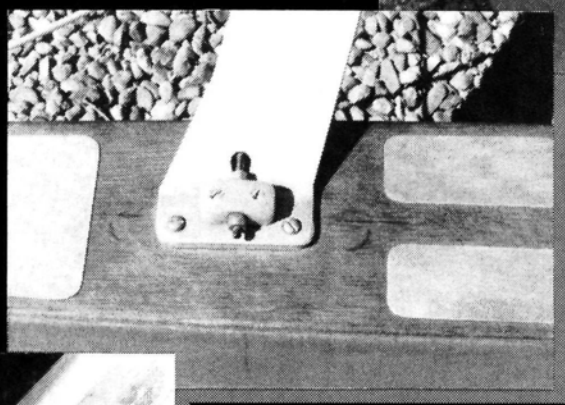
▼ The strap aluminum gear leg and spreader are stacked and held with two wood screws to an embedded wooden deck plate. Simulated rivets, panel lines and an aluminum finish add realism and really make this float system stand out.

▼ The wooden deck plates and airfoil-shaped spreader bars have been finished with glossy varnish. The neatly wrapped, soldered gear leg and "N" strut terminate in a nylon nose-wheel block. Three wheel collars hold the gear leg firmly in place. Setups like this can break all conventions and still look great.



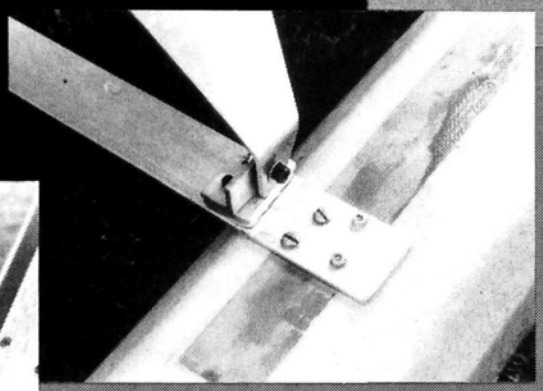
▲ The aluminum "N" struts and spreader bar terminate at an internal hard-point on this Byron Husky float. Seal these entry points with silicone to keep out water. Note the turnbuckle and threaded rod used for cross-bracing. This is an extremely rigid setup.



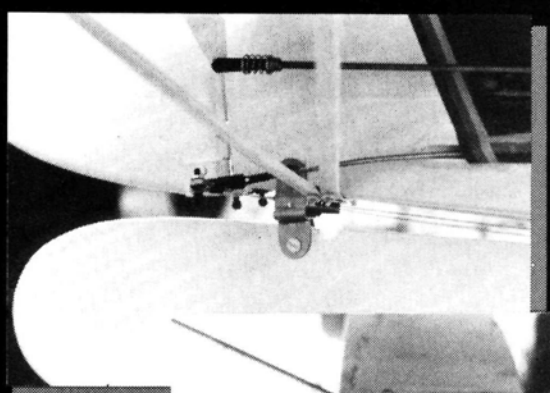


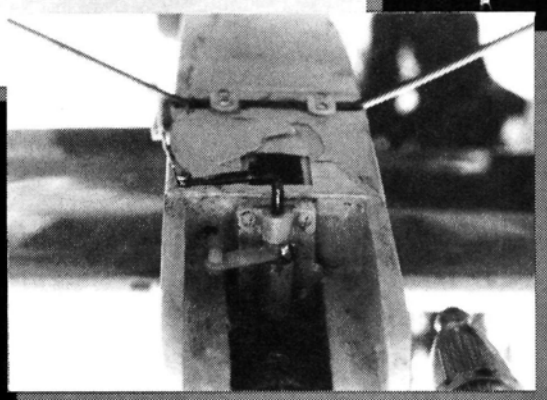
▶ In this setup, a music-wire spreader pierces the aluminum gear blank and terminates in a nylon block. The four hold-down screws are staggered to provide strength and to prevent the float from twisting. The 1/64-inch ply strips simulate deck well plates.

▼ This setup is a tinkerer's delight. A sub-fin has been hung from the tail group with mating brackets. A pair of ball links on a swing arm ties off water-rudder cables. To complicate matters further, two stab struts end in the same area; an air rudder pushrod and a horn are in there, too! If you can finish something like this, you're ready for anything!

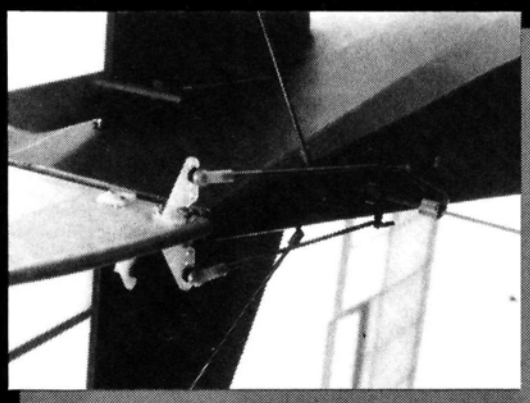


▲ This modeler used a stock landing-gear blank and achieved additional float spread by bolting it even with the inboard edge of the float deck. The connection between the gear leg and the spreader was made with a fabricated "T" section, but a stock aluminum section could have been used. Notice the glassed-over wooden deck plate embedded in the float.





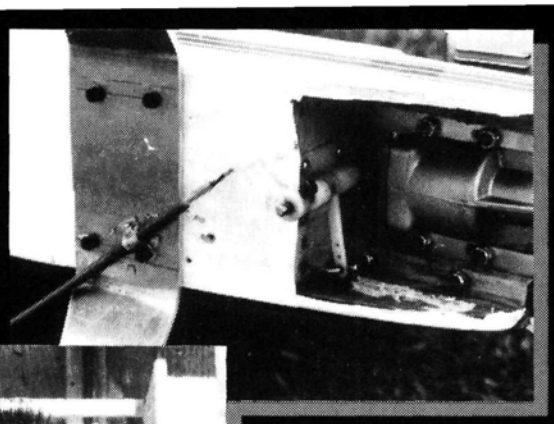
▲ These pull/pull water-rudder cables have been reversed by threading the cables through swept brass tubing sections that are soldered to the rear music-wire gear legs. Proctor multi-strand leader wire is coated, so it doesn't bind. This system eliminates the complexity of pulleys, and line tension is less critical.



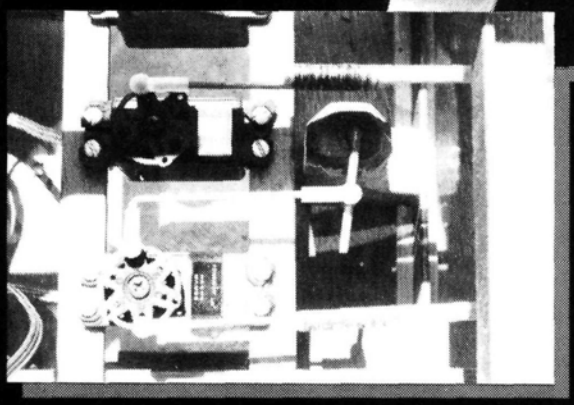
▶ This single-shaft, tail-mounted drop rudder is driven by two opposing nylon control horns mounted on the air rudder. It's difficult to see, but the shaft holder is screwed into the fuselage's underside, making the whole unit easily removable for land conversions. Single, aft, water rudders should be submerged only when the model is at rest

▲ The nose-wheel gear wire on this setup has been bent 90 degrees, flattened, and drilled to accept a metal clevis that drives a steel strand cable to a single stern-mounted water rudder. Music-wire float gear is attached to the fuselage's bottom with nylon hold-downs and wood screws. To convert this to a land system, drop the float system and screw in the trike gear.

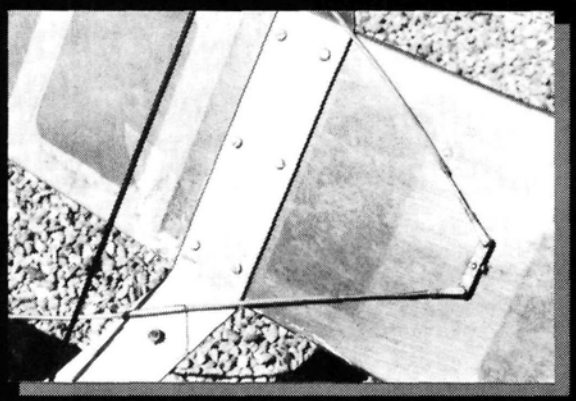
Floatplane Conversions and Gear



◀ This modeler clipped off his nose-wheel-gear wire and added a second swing arm. Stock aluminum gear blanks are attached with cap screws and blind nuts. One of the cap screws is also a pushrod hold-down.

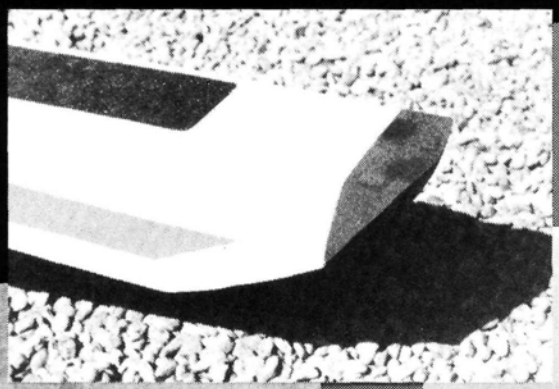


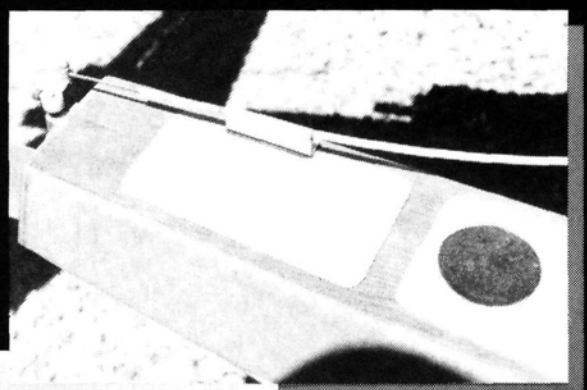
▲ This is a good way to drive water rudders off the air-rudder servo. A threaded rod with ball links pushes an L-shaped music-wire shaft that penetrates the fuselage floor. Many modelers simply run another flexible pushrod through the fuselage, down a rear gear leg, and out to the stern of the float.

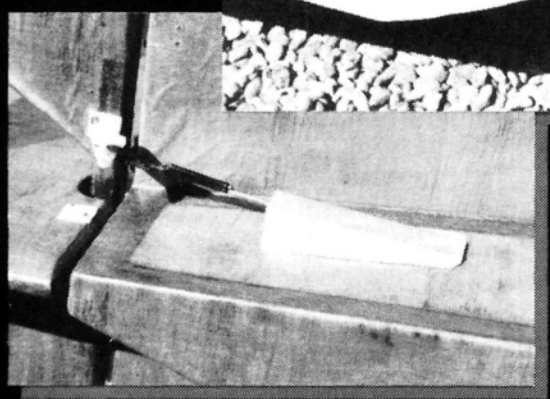


▲ Here's the other half of the servo-driven down shaft. The shaft is housed in a brass tube and terminates at a swing arm that's soldered to a wheel collar. The multi-strand Sullivan throttle cable controls the water rudders. An extra 1/8-inch ply plate is all you need to reinforce the fuselage's bottom for float-gear attachment, because fore and aft gear spread the load.

▼ To make a rubber bow, cut the piece you need out of a rubber mallet with a band saw. The bumper was secured to the float with silicone. The heavy rubber also served as a needed nose weight in this application.







▲ Aluminum flashing was used to fabricate this L-shaped cable standoff. Two screws hold the standoff in place, and a rubber gasket prevents leaking on this built-up float. The dark circle is a piece of inner tube that was glued with contact cement over a deck inspection hole. The rubber cover can be peeled off and re-installed.

▲ This view highlights an "N" strut hard point on the fuselage of a Byron Husky. A remote on/off switch is located just above the plane's logo. The one-piece strut tab was bolted to a bulkhead bracket inside the fuselage. The modeler has burnished the gear legs with a swirl pattern—nice touch!

▲ Sometimes, water can enter the fuselage through pushrod exit slots. Make a spray deflector out of light aluminum flashing material and attach the shield with silicone. Aluminum flashing is available through builders' supply outlets. One small roll could last a whole club for a lifetime!

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

SEND IN YOUR SNAPSHOTS!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1991. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to:
Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

■ PROJECT MUTANT X#1

Mark Richmond of Toledo, OH, holds what he calls Project X#1. It started as a Goldberg Piper Cub Anniversary Edition, and it has been modified with a clipped wing and only 1/2 inch of dihedral to improve aerobatic capability. The pump-equipped, K&B .61-powered Cub is covered with white MonoKote and trimmed in pink, blue and purple using MonoKote trim sheets. The Goldberg floats are painted with Peltron paint and the pilot is a Mutant Ninja Turtle. Can't you just hear him say, "Cowabunga, let's go fly!"?...John Sullivan is very proud, we're sure.

• • • • • •

■ MAJOR DANGER'S SPLAT-O-BAT

Air Force Pilot William "Joe" Seitz also loves R/C flying. He sent us photos of five of his nine planes! Major Danger Seitz says that the O.S. .40-powered Great Planes Sportster Biplane is the prettiest of the lot because his art teacher wife, Debbie, handled the "totally awesome" splatter-paint finish. We concur, and we also like the wing struts! A year ago, Joe was stationed in Panama, where he continued to build R/C kits; now, he's a member of the Hill Country Radio Control Association of Austin, TX, where he says he has made many "great friends." There's nothing like Southern R/C hospitality!

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■ MONSTER MUSTANG

Lee Palizzolo's efforts to "scale-out" this beautiful 102-inch, 42-pound Nosen Mustang have certainly paid off. Except for the prop, the "Detroit Miss" looks frighteningly full scale. The Castro Valley, CA, modeler powers this giant P-51D with a Sachs Dolmar 5.8. Lee tells us that the Mustang has an 8-channel radio and that he uses all eight channels. But Lee, you never told us what they're used for! All *eight*? Do you have in-flight fuel-mixture control? Functional machine guns? How can you leave us hanging like this?

■ VIRGIL'S FORTRESS

Big Virgil VanBibber of San Jose, CA, stands proudly with the 10½-foot-span B-17 he scratch-built from Bob Holman plans. This 38-pound, 12-ounce beauty is equipped with Jim Fox scale landing gear, Holman cowls and plastic bubbles, flaps and bomb-bay doors. Virgil states, "The B-17 flew a trimmed-out perfect first flight. The four K&B Sportster .45 engines performed beautifully and were more than enough power for the B-17." Oh yeah, if the photo looks a little surrealistic, it's because the grass field isn't grass; it's Astroturf.

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■ FLYING SHRINE

As a child, Jon Christenson, president of the Windom Eagles Model Aero Club in Windom, MN, looked up to Charles Lindbergh and his world-famous Spirit of St. Louis. Thirty-five years later, Jon scratch-built this 1/7-scale flying tribute to his childhood hero. Jon says that, although the 75-inch-span model was difficult to balance, the effort paid off. The Spirit "flies very well and is a great crowd pleaser." The Saito .50 Gold Knight-powered model looks very full scale with the Micafilm covering, and the transparent cockpit and the rural setting of the photo add the finishing touches. Very nice, indeed!

• • • • • •

■ STERLING STEARMAN

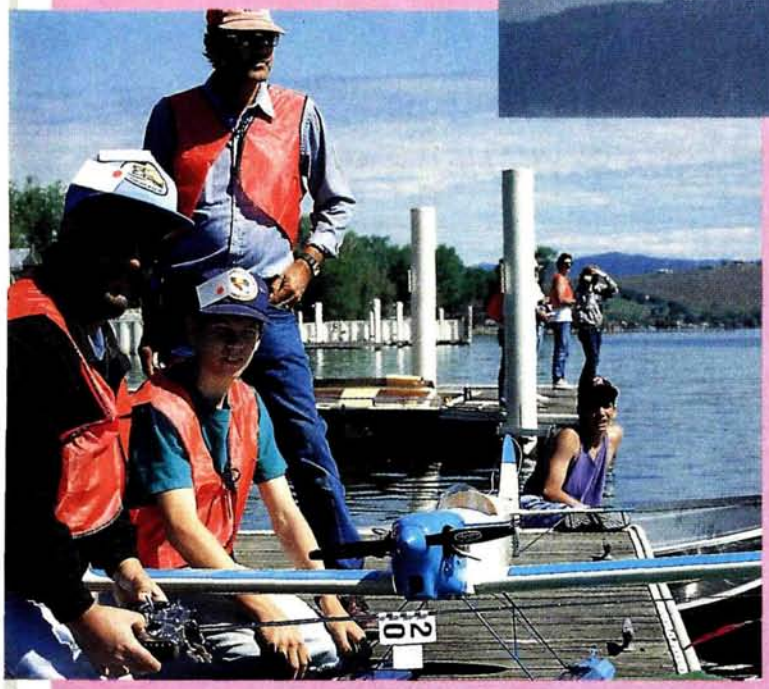
Martin Gambill of Sumter, SC, built this beautiful 1/6-scale Stearman from an old Sterling kit that's unfortunately no longer available. The 12-pound model is powered by an O.S. Surpass .90 4-stroke that adds a beautiful sound to the plane's old-time look. The model is covered with Coverite and painted with Black Baron paint; the trim is a combination of Permagloss and Black Baron film finished with a coat of clear satin polyurethane. The lettering is Vinylwrite Custom Lettering, which Martin says is a time-saving product. Martin says in his letter, "Hopefully my next project, a WACO ZPF-6 biplane, will be better." Please, Martin, if it's as good as the Stearman, send us a photo; it will be beautiful!

• • • • • •

■ STA IN FLA

George Gravel of Boynton Beach, FL, has equipped his Super Tigre 3000-powered Byron Ryan STA with running lights and landing lights that illuminate when the flaps come down. Owing to the relentless daytime trade winds, night flying is popular on the Florida Gold Coast. Granted, things calm down at night, George, but what happens when you pull up those flaps?!

Clockwise from right: ■ In the air, the Estes Cub surprised everyone with a Bennett smoke system. Note the Konocti mountain range in the background. ■ Cliff Sands hit a patch of hard water with his Sachs 3.7-powered giant-scale Howard DGA. The impact punched the right struts through the float deck. The damage can easily be repaired, and this beautiful bird will fly again. ■ The main dock was away from the shore, and walkway docks kept spectators away from the flight line.

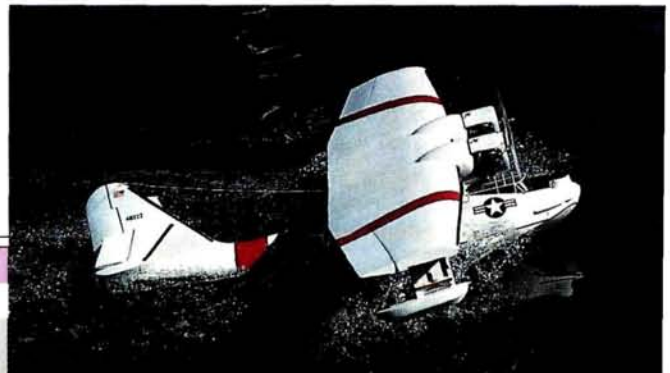


Clearlake

FLOAT FLY-IN

Above: Dick Hershey displayed his latest creation—an 11-foot, twin G62-powered C47 on floats. The C47 has special significance to Dick, as the late Mo Curry was his partner for this project. At 75 pounds, this beauty wasn't allowed to fly at the meet. Right: Cliff Sands and Tom Davidge flew this 9-foot PBY on Twin Saito .80s. The PBY was built from a Tiger Fiberglass and Marine kit that's no longer available.

HOW DO YOU yell in print? ***CLEARLAKE!!!*** That ought to do it! For many West Coast modelers, Clearlake is the first rallying cry of the year. For many months, they've been cooped up in the shop, sneaking out between violent storms and unpredictable winds to eke out a meager flight or two. Spirits sag, impatience grows, and the need to gaze at a pit area filled with hundreds of models becomes almost too much to bear.



Into the valley of fun flew the 600 (floats)

PHOTOS BY JOHN SULLIVAN

Clockwise from top: ■ Bruce Estes of Foster City, CA, warms up the Zenoah G38 on his Balsa USA clipped-wing Cub with Coverite and K&B finish. ■ Desert Storm fever resulted in a few models that never made it to the Gulf. Tony Kussavage showed up with his piped, Kraft .61-powered MiG 27 Flogger on scratch-built 48-inch floats. ■ Jim Martin displayed this electric-powered, single-screw plastic decoy duck. The bows of two Sullivan floats form a tunnel hull under it. Its other features include a standing antenna and twin dual-fin rudders. Real ducks give this thing a very wide berth! ■ Brothers Ralph and Phil Burton have nearly completed their second Schneider Cup entry—a British Short-Bristow Crusader. This model of a 1927 Venice race entry is powered by a Technopower 9-cylinder radial. Its projected weight (at completion) is 25 pounds.

by JOHN SULLIVAN

'91

Then Clearlake happens. It's the first major meet of the year, and it's on the water! The fun-starved float fliers pour into the lake-side resort community of Lakeport, California. They fill the motels and lodges; pack the restaurants; send swarms of floatplanes into the air; and talk models, engines and radios until their throats are dry. This year, modelers from Canada, Washington, Oregon, Colorado, Arizona and, of course, California, converged on Clearlake to end their winter of discontent and begin their summer of fun!

PICTURE PERFECT

It's hard to imagine a site more perfectly suited to a float meet than Lakeport on Clearlake. The "pit area" is actually a one-block square park fronting the shoreline, and it's covered with lush, green lawns, meandering walks, 100-year-old shade trees and permanent benches and picnic tables. There's even a playground for the kids, and a Victorian gazebo (big enough to accommodate a full-blown Dixieland band) that serves as a transmitter impound. Piers extend out to a block-long dock and provide the necessary separation between flight line and spectators, while a 25-foot, square, elevated lifeguard platform midway along the main dock serves as an observatory for flight personnel.

This entire complex looks out on Clearlake (the largest natural lake in California), which is rimmed on its eastern shore by the Konocti mountain range. It's spectacular! Launching ramps flank the park at either end (they're closed to the public during the meet), and they provide a launching area for giant-scale aircraft. A '50s-style resort with cabins and RV sites

Bruce Estes' 22-pound Cub was equipped with Balsa USA floats and handled very well on the water.

adjoins the park on the south, while another RV site, owned by the city of Lakeport and provided free during the meet, can accommodate about 80 RVs on the north side. In the blocks surrounding the park, modelers can find dozens of shoreline resorts and many restaurants with affordable rates. All of this makes for a pretty happy bunch of campers every year when Clearlake rolls around!

FAIR WINDS AND FREQUENCY CONTROL

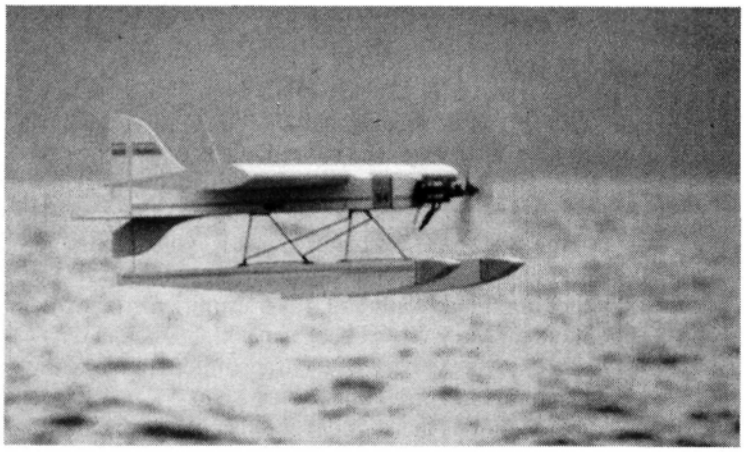
The 1991 meet was held in memory of Mo Curry, one of the event's founding fathers. Northern California's unpredictable, blustery weather calmed down for three days of light-to-moderate winds, sunshine (or high clouds), and water conditions that went from ripples to a tolerable light chop. No one was blown over, and most modelers took their turns when they were called.

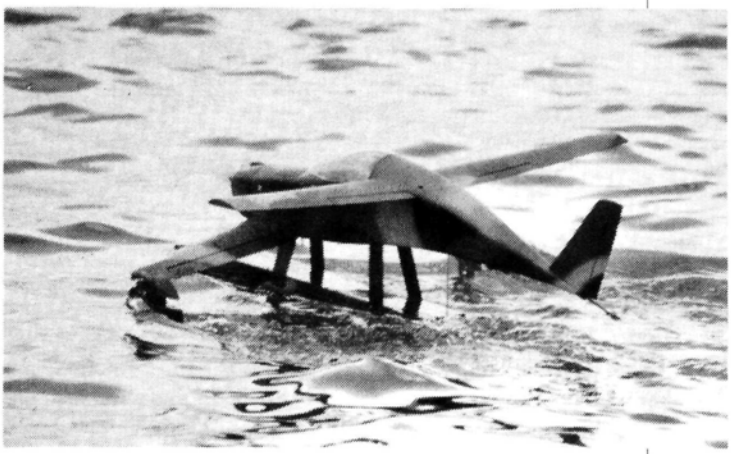
This was the transitional year for narrow-band equipment, and a few modelers were temporarily skunked when they arrived on Friday and were informed that they needed gold stickers on their transmitters. The Clearlake group was, however, able to locate an associate of club member George Steiner who showed up on Friday afternoon with a spectrum analyzer, an oscilloscope, etc., and most of the equipment was subsequently approved. A lot of people assumed that if they'd bought their radio recently, or if it was was advertised as 1991-ready, they were in business, but that wasn't true. It must have a gold sticker on its transmitter case (or in some instances, inside the case), or you don't fly at an AMA-sanctioned event!

Frequency control was very well-managed. As usual, certain channels were heavily populated, but the frequency booth managed to call everyone at least twice a day. There were 128 registered floatplane pilots, but even more remarkable was that most fliers showed up with two, three, and in one case, *nine* planes ready to fly. This swelled the ranks of aircraft to well over 300! Add to this 50 Clearlake modelers who didn't register but worked all three days; families who came along for a weekend at the lake; over 3,000 spectators each day; as many as eight planes in the air at once; raffles; Saturday-night barbecues; club-sponsored breakfasts at the Lakeport yacht club; plus a half-dozen manufacturers on site, and you have float-flying modeling mayhem!

"...most fliers showed up with two, three and in one case, *nine* planes ready to fly."

(Continued on page 46)





Above left: Like with full-scale aircraft, the addition of a sub-fin gives great yaw stability. With a floatplane, this is particularly helpful in the prevention of "water-looping" during the takeoff sequence. Above: In keeping with the Desert Storm theme Phil Babben of Napa, CA, brought a "Camo-Quicky" with pylon and tip floats.

by WALLY ZOBER

F U T A B A

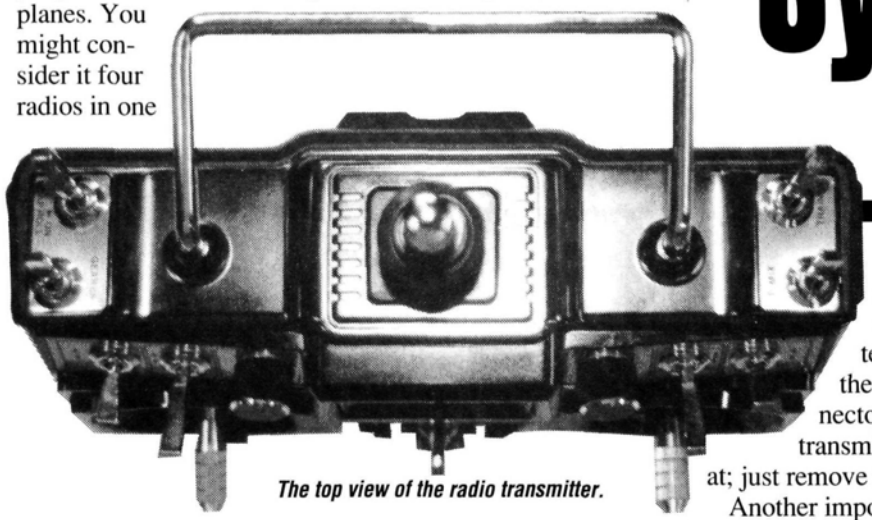
An aircraft, glider and helicopter radio in one

Super 7UAPS 7-Channel System

ON THE FIRST PAGE of the Futaba instruction manual it says, "Thank you for purchasing a Futaba Digital Proportional Radio Control set." I, for one, would like to thank Futaba for a fine piece of high-tech equipment. The new Super Seven R/C system will allow us to fly our sophisticated R/C models with total assurance and, when used and maintained properly, it will work perfectly every time.

We've come a long way with our R/C equipment—from super-regen single-channel receivers and Babcock escapements, to multi-channel reed systems using large tin-can-type servos, to analog proportional-control equipment with Bellamatic servos using mechanical centering springs. We later progressed to digital proportional-control radios with electronic feedback servos that were large and heavy. Now we have what might be considered the *ultimate* computerized digital proportional control PCM/PPM-FM R/C system with almost indestructible, superfast, high-torque servos.

On going over the manual and the accompanying literature, I found that the Super Seven is really three radios in one, or possibly four radios in one. Let me explain. Because of its advanced software, the Futaba Super Seven can be programmed for fixed-wing aircraft, helicopters, or sailplanes. You might consider it four radios in one because you can store the complete data banks of four models. This radio has many ingenious features. One is a trim button that allows you to reset all trim tabs to neutral without losing the trim established. I think the Super Seven is one of the most versatile R/C systems available.



The top view of the radio transmitter.

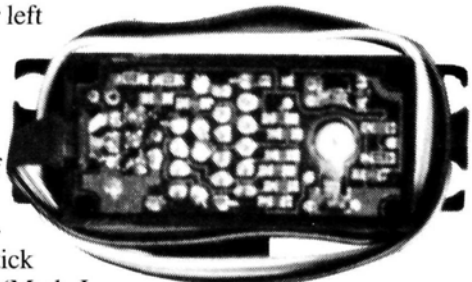
TRANSMITTER

Let's talk about the transmitter. It's a superbly designed piece of high-tech equipment. All the switches, buttons and knobs are easily accessible and neatly laid out. At the top center of the transmitter is a liquid-crystal panel display (LCPD). I'd like to call it a "heads-up display." When you turn on the transmitter, the heads-up display shows the Normal Display Mode, the Edit Display Mode or the Error Display Mode. The panel displays all the information necessary in each display mode. Just below the left control stick are six edit keys that allow easy data setting.

There are two removable items on this transmitter (excluding the antenna): the radio-frequency (RF) module and the transmitter Ni-Cd battery pack. The RF module is on the back of the transmitter and can be plugged into a connector that's recessed in the transmitter case. The transmitter Ni-Cd battery pack is quite easy to get at; just remove the rear panel cover.

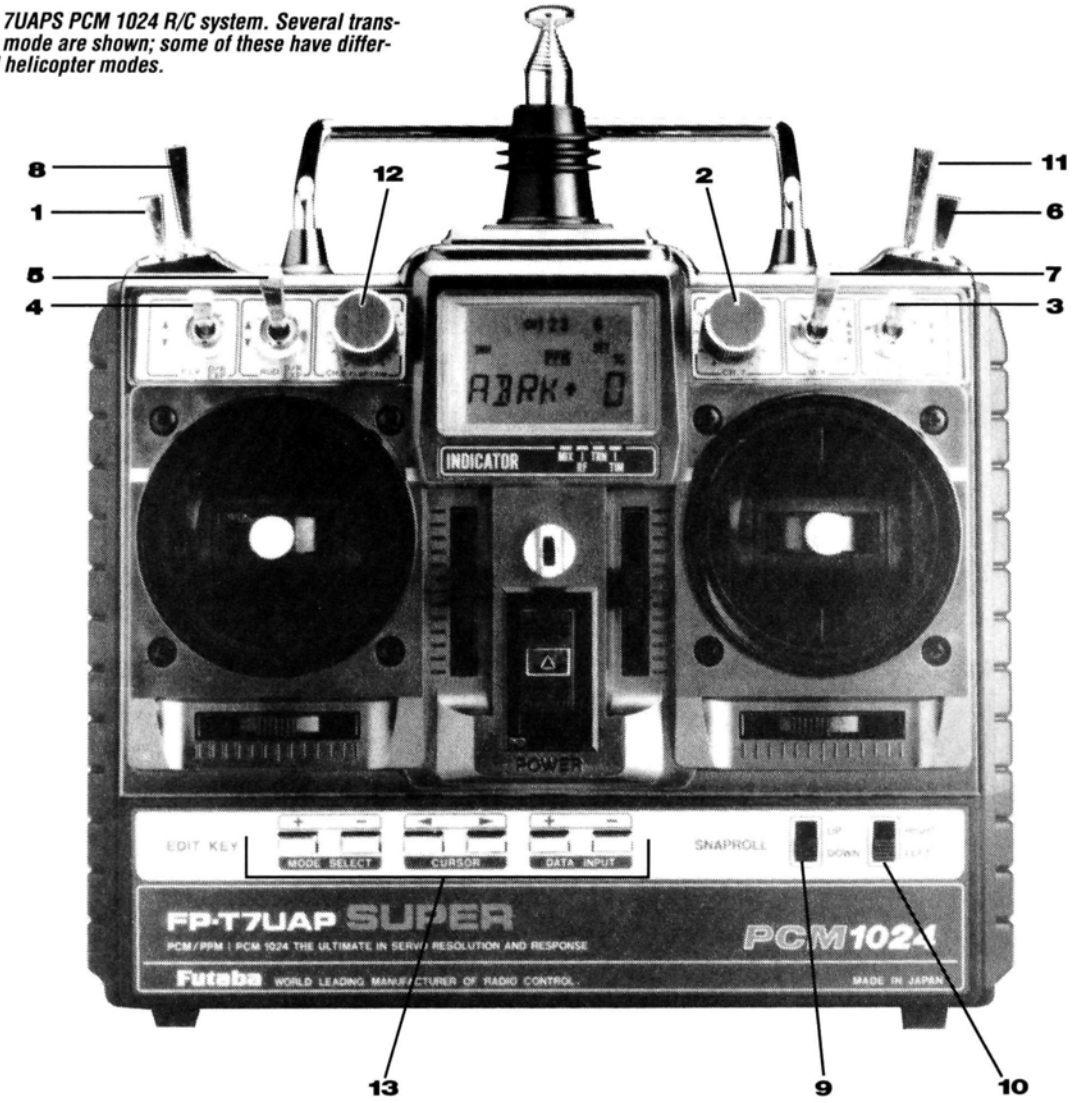
Another important feature of this transmitter is that when you remove the 9.6V Ni-Cd battery pack, the pre-set data isn't lost. Also, on the back of the transmitter are the charging jack and trainer cord with their dust caps.

Another feature is the stick-lever tension adjustment. Remove the back cover (unscrew four screws). You'll see two screws in the upper left corner for elevator and aileron stick adjustment (Mode II configuration). On the right side of the case, there are two screws for rudder- and elevator-stick tension adjustment (Mode I configuration). To adjust spring strength, turn the screw on each stick with a small Phillips-head



Futaba's S-148 servo bottom with the cover removed to show the durable soldering.

The front view of Futaba's 7UAPS PCM 1024 R/C system. Several transmitter features for aircraft mode are shown; some of these have different functions in glider and helicopter modes.



1. **Landing-gear switch (Ch. 5; Mode III)**
2. **Auxiliary knob (Ch. 7)**
3. **Aileron D/R switch**
4. **Elevator D/R switch**
5. **Rudder D/R switch**
6. **Programmable mixing switch (Mode II)**
7. **2 to 6: air-brake mixing switch**
8. **Snap-roll switch (Mode II)**
9. **Snap-roll direction switch (up/down)**
10. **Snap-roll direction switch (right/left)**
11. **Trainer switch (Mode II)**
12. **Flap knob/flap trim lever (Ch. 6)**
13. **Edit keys**

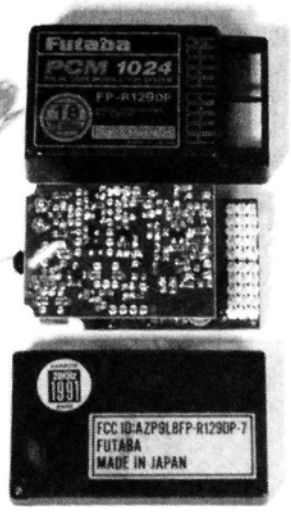
screwdriver. Another nice feature is the non-slip, stick-head adjustments. Just unlock the lever heads by turning them, adjust the sticks to the most comfortable lengths and lock them in place.

FUNCTION AND DATA SETTING

The Futaba Super Seven R/C system was designed to be "user friendly" and, to a point, it is; however, this system wasn't designed for the novice R/C flier. It really was meant for advanced or expert fliers who want to get more out of their high-performance pattern, glider, scale, or helicopter model. The nice thing about the Super Seven R/C system is that it meets all of the requirements for any of these types of models at an affordable price.

DISPLAY MODES

When you turn on the transmitter, the first screen displayed is the Normal Display Mode. This tells you the battery voltage and the integrated time display (ITD), which goes from 0 to 199 minutes. It also tells you if you're in the PCM mode or the PPM mode, and it gives you the model memory numbers one to four. In the lower right hand corner is a blinking bar, which blinks at 1-second intervals (this is part of the ITD). An RF indicator bar lights up when radio waves are transmitted. A third bar—the mixing indicator—flashes when snap-roll mixing, 6-2 mixing, idle-up, throttle hold, inverted flight or rudder offset is on. To alert you that radio power is on, the buzzer also sounds when the power switch is turned on.



The receiver (shown removed from its case) and the 2.5x1.5x1-inch case weigh about 1.53 ounces.

You enter the Edit Display Mode by pressing the Mode Select buttons simultaneously. A new screen will appear that displays Adjustable Travel Volume (ATV). This function adjusts the servo left and right throws and is used in linkage correction. The rate can be set for each channel. The rate-setting range is 30 percent to 120 percent.

Each time you press the Mode Select Positive (+) button, a new screen appears that shows a new function, which now can be programmed. The next function screen is the (DR) Dual Rate function. Dual Rate is activated by a dual-rate switch, and it's usually used for ailerons, elevator and rudder. It can be set for each direction of the dual-rate switch (i.e., up or down can turn on dual rate). This is good, as you can select the switch-throw position you want for high or low rate.

Super 7UAPS 7-Channel System

SPECIFICATIONS

Type: *2-stick, 7-channel, computerized PCM/FM unit*
Available U.S. frequencies: *72MHz, 50MHz band*
Receiver: *the FP-R129DP is a dual-conversion 1991 PCM/FM-PPM*
Power requirement: *transmitter—9.6V Ni-Cd; receiver battery—4.8V*
Servos: *four S148s*
Sug. retail price: *$699.95 (Futaba also sells an FM-only version—the 7UAFS—which lists for $599.95)*
Features: *the Super Seven includes a transmitter, a receiver, Ni-Cd batteries for the transmitter and the receiver, four FP-S148 servos, a charger-receiver switch, an aileron extension cord, servo horns, grommets, a servo tray, a frequency flag or a ribbon and a 51-page instruction manual. (A trainer cord is optional.) Modulation: either FM or FM-PPM.*
Comments: *this sophisticated, high-quality system is for advanced or expert fliers who want more out of their high-performance pattern, glider, scale, or helicopter models. The 7UAPS uses computer technology to provide a wealth of control options for these aircraft, all in a single, well-engineered, reliable package.*

Range setting is 30 percent to 120 percent.

Press the Positive Mode Select button again, and you now have (EXP) Exponential. This function modifies the operating curve to facilitate operation of the aircraft when the movement of the servo is sluggish or sensitive near the neutral position. The rate can be set for each direction of the Dual Rate Exponential switch. Thus, this radio allows you to combine exponential and dual rate any way you want. The rate settings range from (-) 100 percent (slow side) to (+) 100 percent (fast side) in 4-percent steps.

The next function is (REV) Reverse. This function modifies or changes servo direction of operation, and it can be used on each channel.

FAIL SAFE

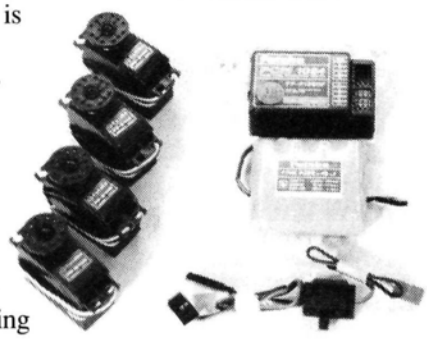
The Super Seven R/C system also features Fail Safe and Hold functions. Fail Safe and Hold can be set for all channels, or they can be selected for each channel.

• **Fail Safe (FS).** This goes into effect when interference occurs. The servos will move to a predetermined position selected for this function. When the interference ceases, the Fail-Safe function will reset to normal operating function.

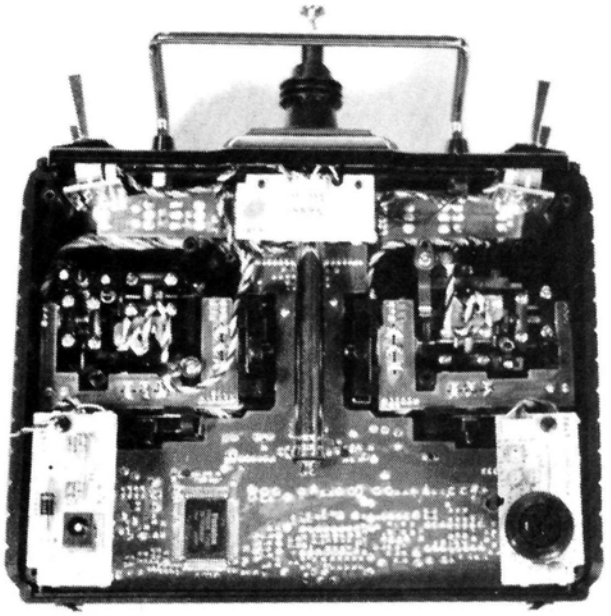
• **Hold Function.** The Hold-Function setting takes place should interference make reception impossible. The servos will stop at the last given command. When interference ceases, the Hold Mode is released.

• **PMX-1 and PMX-2.** You can mix any two channels. The left and right and up or down mixing rates can be set independently. The setting range is from 0 to 100 percent (mixing maximum). These mixing functions are useful in correcting any bad tendencies of the aircraft, and they help to make flying more pleasant.

• **Acro 2-6, Elevator Flap Mixing (EFM).** Mixing elevator and flaps is an idea that was borrowed from our U-Control flying buddies. When you add up-elevator, you automatically add down flap, which makes circular maneuvers smoother.



Futaba's airborne flight pack with the receiver, the four S148 servos, the switch harness and the battery pack.



The rear view of the transmitter with the back panel removed.

• **(GLID 1-4) Aileron Rudder Mixing.** This function is very useful when you're flying a giant-size R/C model or a large, high-performance glider, where you require rudder and aileron control for coordinated turns. On smaller models, aileron and elevator are used to make turns. On larger models, you run into a problem of Adverse Yaw Effect: the tendency of the ailerons to pull the aircraft's nose around to the right when the airplane is banked to the left. The same thing happens to your airplane when it banks to the right—the nose wants to go to the left.

I can't list and describe all of the Edit Mode Functions, however, some of the functions for R/C fixed-wing aircraft include: (SNP) Snaproll, (DIFF) Aileron Differential, (FLPR) Flaperon, (ELVN) Elevons, (FLTR) Flap Trim, (STRM) Sub Trim, (STAT) Start Mixing Glider, (VTAL) V-Tail Mixing. Additional system functions include: System Data Settings (PARA) Parameter, (RSET) Data reset, ATL Trim on/off, (COMB) Combination switch, (MXSW) Programmable Mixing Switch.

• **Error Display Mode**. Battery Voltage is continuously monitored on the heads-up display (LCPD). When the transmitter battery voltage drops below 9 volts, the low-battery error display appears on the screen. The characters flash and a buzzer sounds.

• **Back-Up Error Display**. The letters (BKUP) will appear on the display flashing with a buzzer sound. Turn off the power switch, and turn it on again.

SUMMING UP

Futaba has come up with a very practical computer R/C system. After reading the manual several times, I started to program it. As long as I followed the instruction manual faithfully, everything worked just fine. It took me a few hours to get it all together, but it's a darn good radio.

Till next time. Stay well and keep'em flying!

Here's the address of the company that's featured in this article:* ***Futaba Corp. of America,* *4 Studebaker, Irvine, CA 92718.* ■

Ed's daughter, Lee Ann Westwood, holding the 2 Ugly.

by ED WESTWOOD

UNTIL RECENTLY, I've designed my ships with a horizontal tail that measures at least 20 percent of the wing area. Then Paul Weston and I tangled with the Beast and found that you could talk nature into relaxing its static longitudinal stability requirements!

Classic longitudinal stability begins with a formula as long as your arm, and it requires that the net change in pitching moment with respect to lift coefficient be negative for an aircraft to be stable. The biggest destabilizing term in the formula is the wing; the fuselage and other appendages cause smaller disturbances. On conventional aircraft, the horizontal tail and its position and area relative to the wing often

2 UGLY

drive the formula negative. But could a ship with stable pitch be made without a horizontal tail? Nature does it all the time with bats and insects; why can't we? Lippish, Northrop and others reasoned that if the wing could be made to work *for* us instead of *against* us, the tail element in the formula could be dropped—thus, the reflexed wing.

Since the reflexed wing is essentially a wing with the tail tacked onto its trailing edge, there isn't the great stabilizing moment of a separate tail; thus, thrust effects and any geometry above or below the CG are of much greater concern in the design. For a tailless model seaplane, the large destabilizing moment of the floats must be dealt with. With some pretty sophisticated wind-tunnel work, you could adjust thrust lines, airfoils and float positions until the formula came out negative and the ship was stable. For a model, trial and error is quicker (and certainly much cheaper), since the only thing that could be hurt in the crashes that accompany development is your ego.

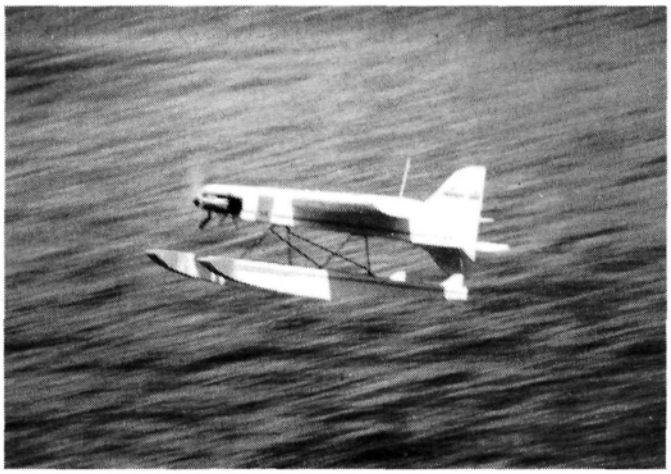
So why go to all this trouble in the first place? Because seaplanes carry excess baggage to float them, and any design that could trade a tail and aft fuselage for the floats is well worth investigation. The Beast has no recognizable tail, but it does have a pitch damper. Why not design a ship that falls somewhere between a Beast and a conventional seaplane? A very short coupled conventional ship appeared on my sketch pad and then on the drawing board. I wanted a twin float ship this time, its pitch controlled with a very small tail and its stability taken care of by a reflexed wing. The trick was to see if it worked. It did. I call the ship the 2 Ugly.

THE DESIGN

I had a pretty good idea that the short coupled/reflexed wing concept would work. *How well* would depend on how light I could make the ship. My "proof of concept" prototype weighs six pounds. That's a pound too heavy for sparkling performance, but quite adequate to convince me the ship is a keeper. The beauty of a drawing board is that weight-saving is at the tip of your pencil, and I went to work on the plans you see now. My original wing was of glassed foam and weighed 1 3/4 pounds (with servo). I shaved off 8 ounces using built-up construction and Micafilm* covering. The float struts weighed 8 ounces,

SPECIFICATIONS

Type: Sport floatplane
Wingspan: 48 inches
Wing Chord: 15 inches
Length: 34 3/4 inches
Weight: 5.2 pounds
Wing Area: 720 square inches
Wing Loading: 17.6 ounces per square foot
Power Req'd: .50 4-stroke or .45 2-stroke
No. of Channels Req'd: 4 (throttle, aileron, rudder and elevator)
Features: the wing has a 15-percent semisymmetrical reflex airfoil that contributes much to the longitudinal stability. The construction materials are foam, balsa and plywood. The wing is built upside-down on a flat surface; the flat part of the airfoil behind the spar is pinned to the workbench. Carbon-fiber tow is used to strengthen the spar.
Comments: you don't need any special techniques to fly the 2 Ugly. Apply aft stick to get the float on step, and you're off. Owing to the short coupling of the flying surfaces, there's a little yaw in turns. A Graupner 11x7 three-blade prop seemed to work best on my Saito .50-powered version.



2 UGLY

so I built another set that weighed 4 ounces. They're indestructible and they look the same. I cut the tail surfaces down from 1/4 inch to 3/16 inch and put lightening holes in them too. My original fuselage was all lite-ply. Yours will have lite-ply sides and a balsa top and bottom.

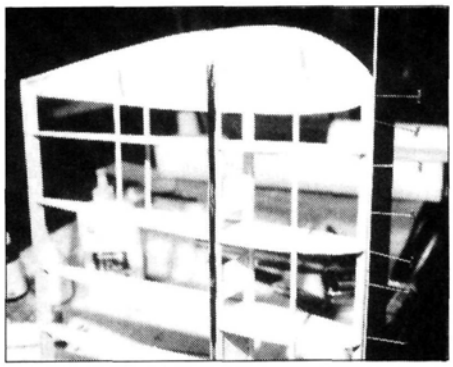
CONSTRUCTION

Use the fuselage side in the plans as a template. Cut it out, tack it to two pieces of lite-ply, and cut them to the form; do the same for the fuselage bulkheads. Mark the sides for the bulkheads, and epoxy them into place, omitting the tail bulkhead for now. Drill the firewall to match the engine mount, and install the blind nuts. Set your mount in place, and position the throttle-cable hole. Assemble the flexible 6-ounce (or 8-ounce, if you use a 2S) Sullivan fuel tank, and mark the firewall where the tubes will exit. Drill 3/16-inch holes for the fuel tubing to fit through. The tubing and brass tank tubes provide the tank with a soft mount in the front. Drill the rear bulkhead for the rudder and elevator pushrod sheaths. Epoxy the float-fitting doublers into place. Add the triangle stock to the sides and remember to notch the stock aft of the rear bulkhead to make it easier to bend the sides in to the tail. Sheet the top of the fuselage with cross-grain balsa to the rear bulkhead so that when you pull the rear of the sides together the front won't be distorted. Now pull the rear sides together and install the tail bulkhead. A small piece of trailing edge stock will provide a gluing surface at the rear. You can now sheet the remaining aft fuselage. Drill through the sides, elongate the holes to accommodate the pushrod sheaths and install them. Don't install the tail surfaces yet!

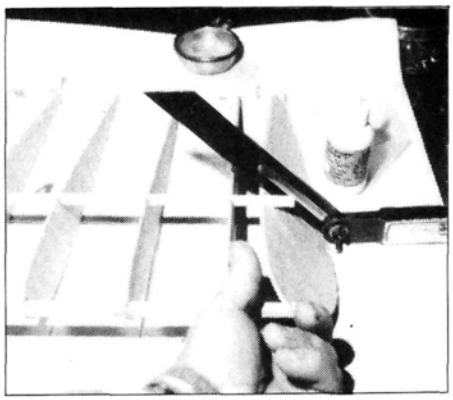
WING

This is a conventional structure built upside down so that the flat area behind the spar to the tail lies flat on your building board. You may think that the structure's a little skimpy but it's more than adequate. Stick with the material suggested. Just remember to install the 1/8-inch carbon tow under the spar caps before they are installed. Install the antenna tube in the left wing's leading edge.

The 1/16-inch leading-edge sheet



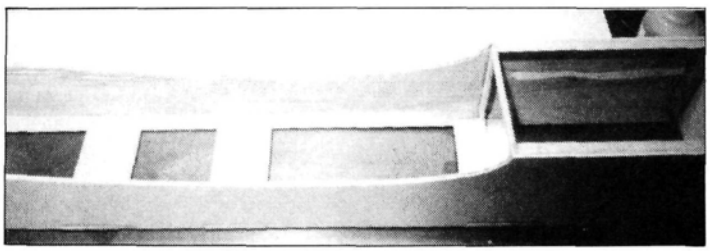
The leading-edge sheet is pinned to the wing while the Tite Bond sets. You can see the .007 carbon tow on the spar cap.

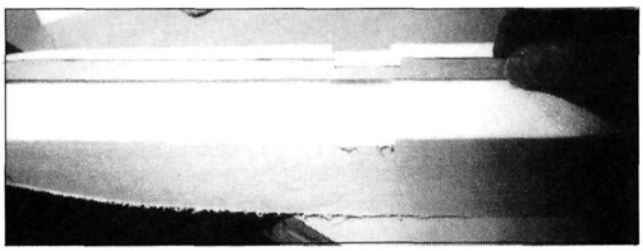


The beveled tips on the first wing were very hard to build and didn't seem to affect the plane's lateral stability. The final wing configuration had straight tips with optional tip plates.

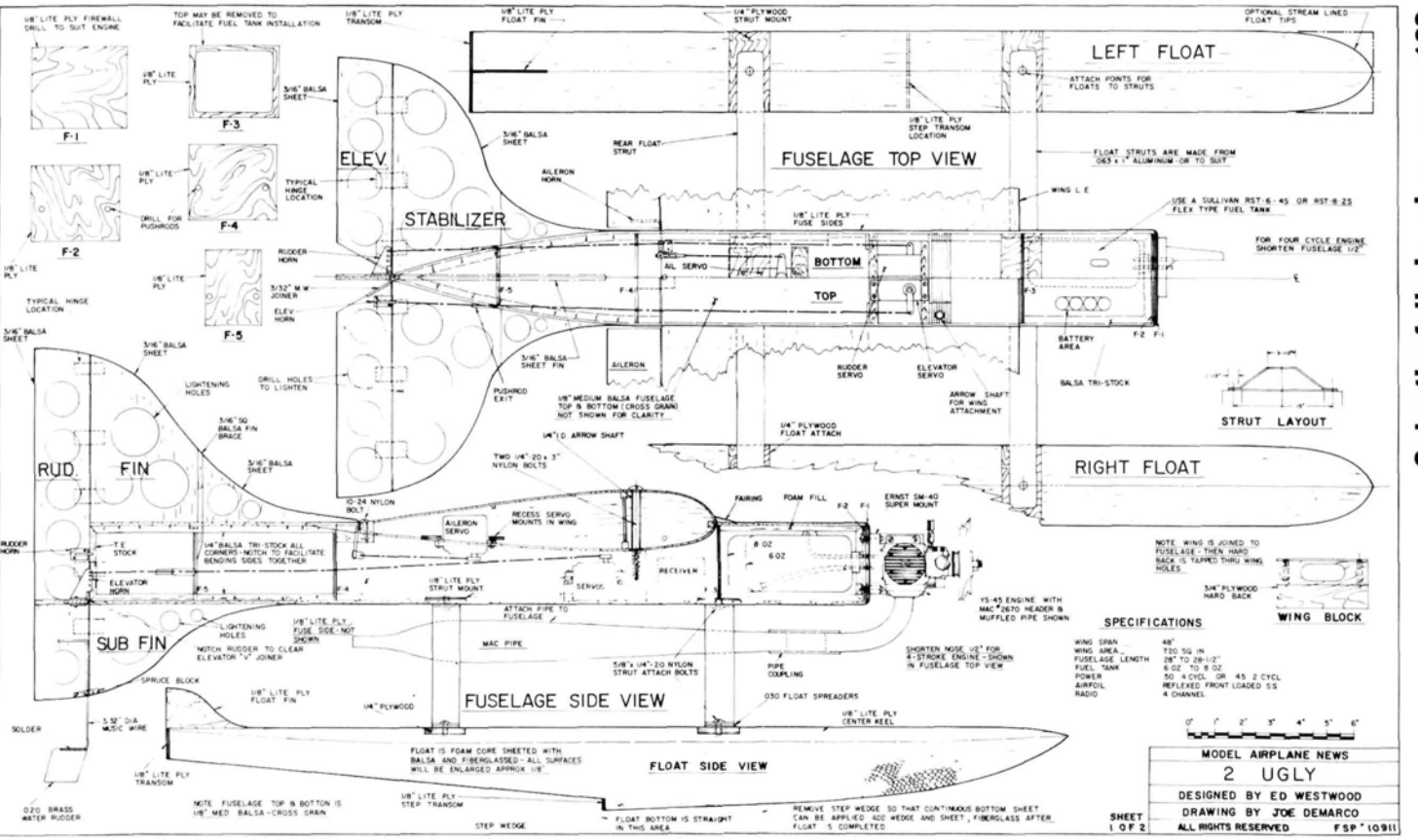
Below left: The simple square fuselage is ready for its bottom and top sheets. Notice the triangle stock on the chines.

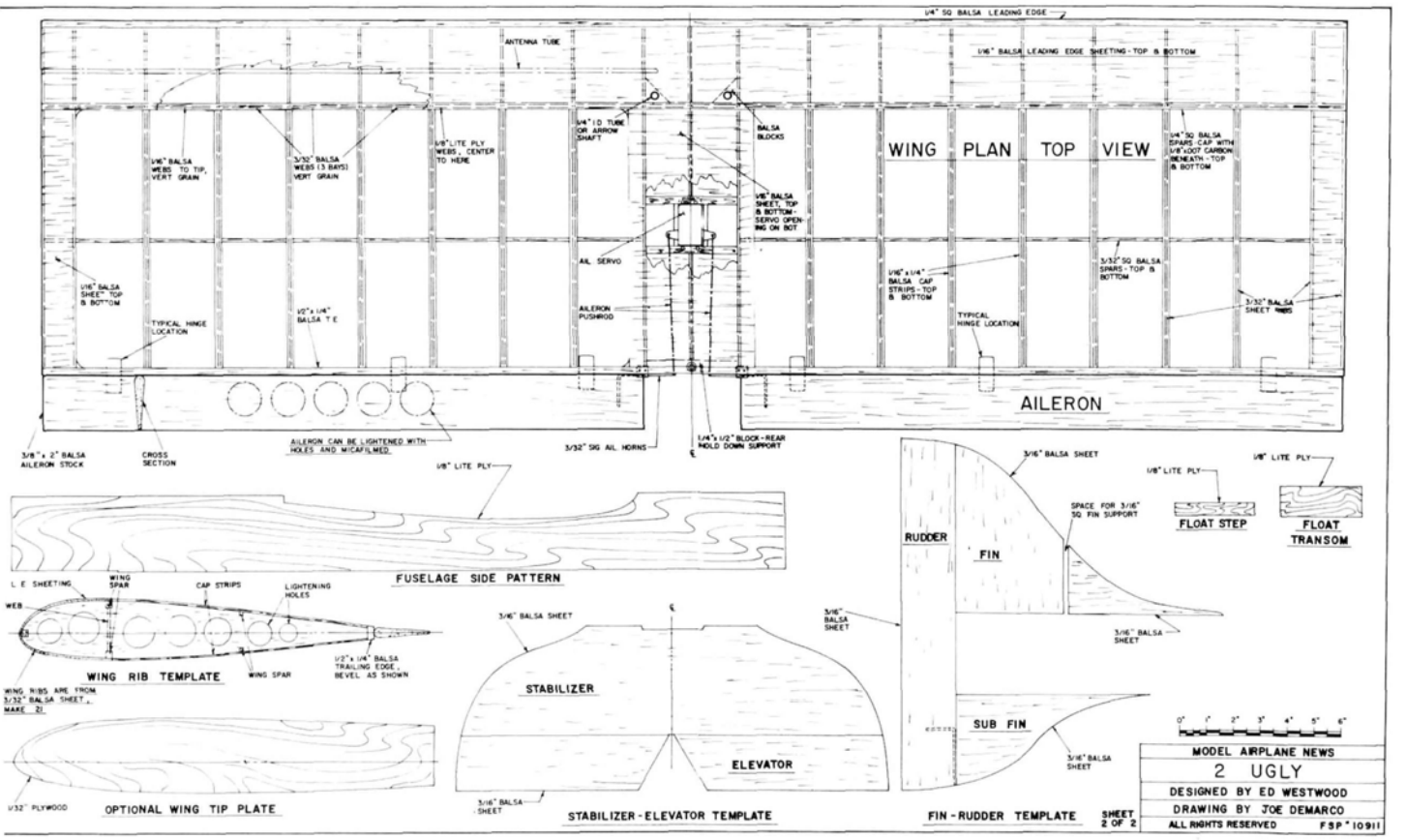
Below right: Installing the 1/8x1/2x33-inch lite-ply top keel. The float top isn't sheeted, so this keel takes the compression load.





Order the full-size plan...page 122

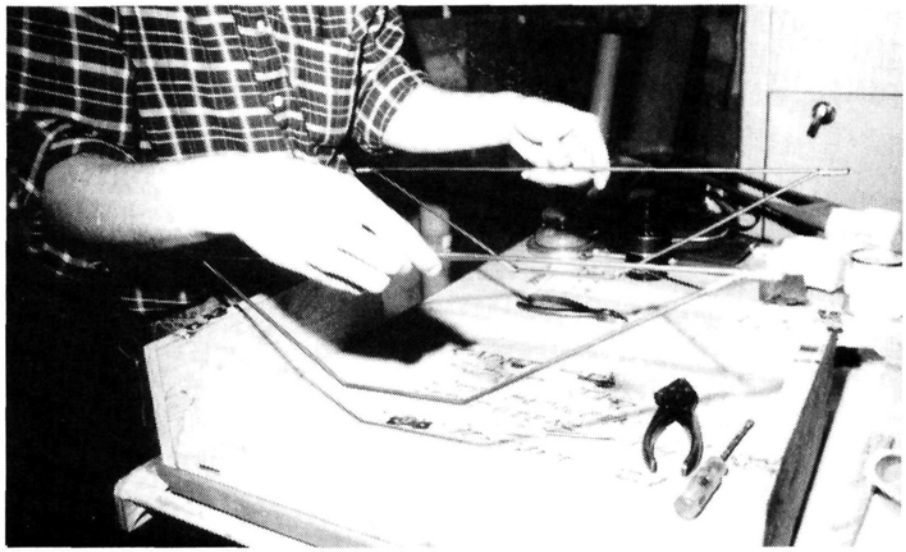




FSP10911 2 UGLY $10

The 2 Ugly is a different sport floatplane. It's a very short coupled, almost flying-wing design, but it has good pitch stability. This easily built model is of balsa, plywood and foam, and it uses a .45 2-stroke or a .50 4-stroke. It may be called the 2 Ugly, but it's a pretty picture flying off the water. Two sheets. WS: 48"; L 34 3/4"; LD 2.

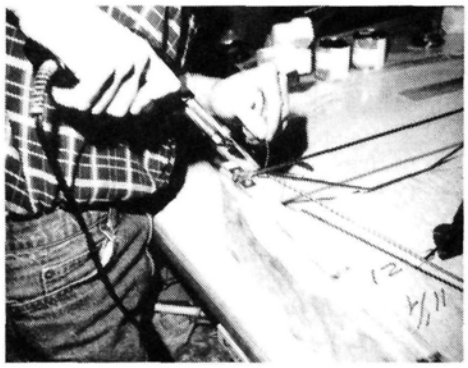
2 UGLY



Removing the down-strut assembly from the jig. Although almost indestructible, this assembly weighed only 7 ounces. Final strut design is .063 inch aluminum with .030 spreaders.

is the only tricky part. Join the 3-inch and 2-inch balsa sheets with some masking tape; to glue them together, bend them slightly to open the crack, then close it before the glue dries. (I use Sigment here rather than CA).

Cut the 4-inch sheets to length and mark the underside where the ribs will touch.



Prototype down struts were made out of 1/8-inch music wire. All joints were secured with no. 26 copper wire and soldered together in jig. A soldering gun works well here, but the joints must be cleaned well and fluxed to get a complete bond.

Now run a 3/16-inch line of white glue along the sheet marks and the ribs. Let it dry. Position and glue the wood to the leading edge first, and let that dry. Now, with the wing secured to the workbench to prevent warping, bend the sheet around the leading edge, and iron over the areas where the white glue is. Start in the center and work outward and upward. Do the bottom in the same way. The rest is a piece of cake.

You can finish and cover the wing now; just remember to cut the hinge slots into the wing before you cover it so that no pesky wood chips are left to rattle around inside. Position the wing on the fuselage, move the hard block until the hold-down tubes are centered, then epoxy the hard block into place. After the wing has been installed, drill through the tubes into the hard block with your 3/16-inch tapping drill (wrap the drill bit with tape so that it can be centered in the 1/4-inch wing tubes) and then tap the block. Do the same with the trailing edge centering block.

Now measure and cut out the ailerons, and fit them to the fuselage. I glassed my ailerons with .6-ounce cloth to stiffen them. When you install the aileron horns, remember to keep them close to the fuselage center to clear the elevator and rudder pushrods, which are close to the sides. Mount the ailerons on the wings now. Next, you can mount the aileron servo in the wing and hook up the links.

TAIL SECTION

Cut out the tail patterns from the plans and transfer them to a 4-inch-wide x 3/16-inch-thick sheet. Be sure to mark the center line so that the stab can be aligned properly. Round the leading edges and drill or cut out the lightening holes. Notch the vee-slot of the elevators to receive the 3/32-inch wire vee-connector. Balsarite* and Micafilm are both light and can seal them nicely.

To attach the tail, first lock on the wing, then secure the stab with epoxy. For good adhesion, prick some holes in the film near the joints. Use the wing as a guide to ensure that the tail isn't crooked. Too many modelers glue on the tail without the wing and get crooked tails for their lack of effort. This ship is ugly enough without such sloppiness! Install the elevator halves with EZ* hinges and join them with the vee-connector; the fin and rudder can be attached similarly. Notch the rudder slightly to clear the elevator connector, and attach the horns and clevises.

FLOATS

These floats are about as simple as any you can make, and the square sides are even aesthetically pleasing. Cut out two 3x3x33-inch light foam blocks. Cut a 1/8x1/2-inch slot along the top centers for the hard back. Glue the 1/16-inch sides to the blocks with Tite Bond or sorghum. If you plan to glass the floats (and I strongly recommend that you do), you can secure the sides with white glue; remember, however, to weight

(Continued on page 64)

GIANT STEPS

RENEGADES, SAWDUST AND RACERS

by DICK PHILLIPS

EVERY ONCE IN a while, an outstanding project comes to my attention. Richard B. Hershey of Lakeport, CA, has been involved in a number of these in the years I've been writing about large models. Recently, Dick sent along a photo of his latest project—a large DC-3 on floats!

Dick is a member of the loosely formed group called the "Lakeport Renegades." I think the name is the result of some of their wilder projects, of which the DC-3 is the latest. The Renegades used to be three, but are now, sadly, only two. (Morris Curry died recently.) The remaining Renegades, Dick Hershey and Wally Rinker, are 83 and 72 respectively, and they still do great work!

The concept of a DC-3 on floats is not as far off base as you might think. I have a photo of a DC-3 on floats in my collection of documentation, so there's some historical justification for it.

Dick Hershey's DC-3 on floats (see text). The Clearlake Renegades are serious builders!

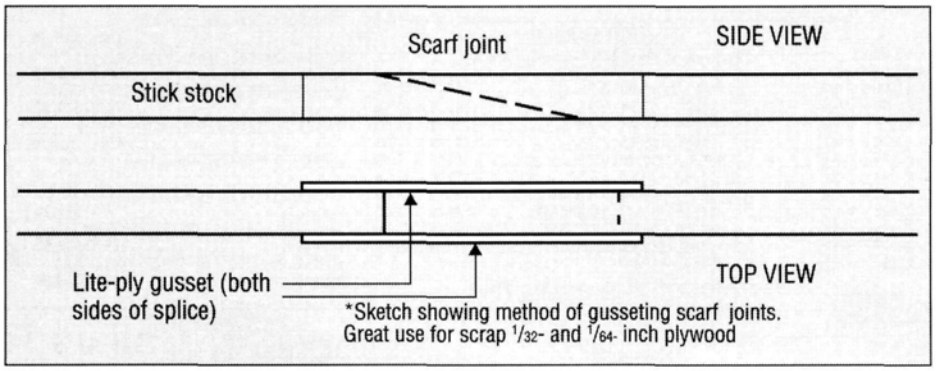
The floats on the prototype looked a good deal larger than Cessna 180 fuselages!

At the time the pictures of Dick's model were taken, it hadn't been flown or floated. Servos were in place only for the throttles and the ailerons. The model is scaled at 1/7.64—an odd selection, but necessary to accommodate the use of a donated fiberglass fuselage nose section. Dick drew the plans (at which he excels) at 1/8 scale and then re-drew them at the present scale. Both sets of plans were drawn from Douglas drawings, so the model is as close to scale as you're likely to see anywhere.

The color scheme is a medium dark gray (primer), and the Renegades decided they liked it that way. It's not far off a Navy color, anyway.

The model was scratch-built from Dick's plans. He also made the metal display props (which are illegal, and won't be flown). As you may have guessed, Dick Hershey is a craftsman of some consequence who does very nice work.

When I last heard from Dick, he had no plans to fly the model, but he has promised to keep in touch. There are plans to videotape the first flight, and I'm hoping to see a copy to comment on it. If it's anything like the Renegades' past performances, it will be a dandy!



*Sketch showing method of gusseting scarf joints. Great use for scrap 1/32- and 1/64- inch plywood

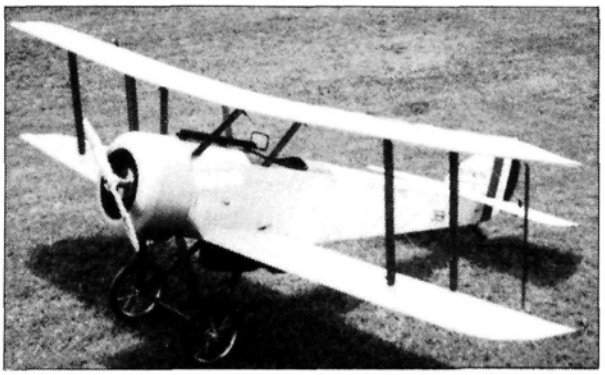
CLEARLAKE

The Clearlake Modelers sponsor an annual water fly at Clearlake each year in May. (It was held on May 10, 11 and 12 this year, and it was dedicated to Morris Curry.) The event is quite popular in California and always attracts a large crowd. It's a family affair, much like a huge picnic. If you ever have the chance to attend, I highly recommended it. *[Editor's note: 1991 Clearlake is covered in this issue.]*

STRIP WOOD

I recently received a letter from a reader who asked how I managed to get spruce

Richard Lucas, of Fort Bragg, CA, sent this photo of his excellent Liberty Sport Model "B," and he included a sketch of the model's shock-absorbing landing gear.



Bret Horton of Corinth, MS, recently completed this Sopwith Pup from a Balsa USA kit. He does nice work!

strip wood long enough to build my models. The problem is, some of our long fuselages require material that's longer than the standard 36- and 48-inch strip wood that's readily available in the local hobby shop.

To solve this problem (and to avoid having to make splices in such strip stock) I cut my own material. The spruce we buy at the hobby shop is usually sitka spruce. It's a particularly nice material to work with because it's relatively soft, i.e., it isn't what would usually be termed a "hardwood." It's also straight-grained and very resilient. It will take significant bending without cracking. Soaking or steaming it will also increase the wood's ability to be bent tightly.

Excellent spruce boards are available from most suppliers to the home-built aircraft market. I get mine from a comparatively local firm, and they have 1x6-inch boards of various lengths. I prefer 6-foot lengths, as they're portable; if you need anything longer, you're probably building full-size airplanes! This material is kiln-dried, and its moisture content is very low. It can be cut like cheese with the right equipment, and it produces material you can use for any model building project.

I cut mine on a radial-arm saw, using a hollow-ground planer blade, but a table saw with a similar blade would do as well or even better. Using the hollow-ground blade and keeping that blade in good condition will permit the production of material that can go right from the saw to the building board. No sanding or other treatment will be required.

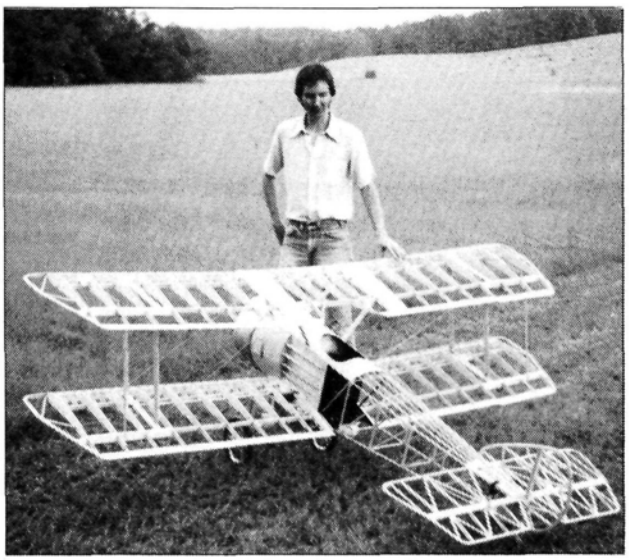
I've cut material right down to $^1/_8$x$^1/_8$ inch, but you must be careful when cutting strip stock this small. The wood is quite dry and can splinter and kick back on you if you aren't careful. A sharp saw blade and the usual safety precautions are absolute musts. For larger material such as $^1/_4$x$^1/_4$ inch, $^1/_4$x$^3/_8$ inch, etc., enough material can be cut from one such board to build several airplanes.

As I mentioned, homebuilders' suppliers are the best source of sitka spruce, but sitka spruce isn't the only material you can use. I've cut strip stock out of a wide variety of woods, including ordinary construction spruce (providing, of course, that it's knot-free and straight-grained). Depending on what sort of material is available in your area, you may find something suitable of which I'm not even aware. Keep your eyes open, and pick up anything you think might work. When I see a particularly good-looking 2x4 in the lumberyard, I take it with me, figuring there's flight in its future!

Boxwood, white pine and any of the soft woods are right for our use. If you don't have the equipment to do your own cutting, check with others in your club or area; there's always someone who can do the cutting for you. In extreme cases, you can always approach the local cabinet shop to do your cutting for you. Most are intrigued by your hobby and will do what they can to assist, often at quite a reasonable fee. Most cabinet shops keep their cutting blades in good condition, and most also use hollow-ground blades for their finishing work.

The beauty of cutting your own material is that you can have wooden pieces of any size called for on your plan without having to do a lot of shopping around. In addi-

(Continued on page 79)



A bare-bones shot of Brett's Sopwith Pup makes you wonder how they put all that wood in a single kit box!

CLEARLAKE

(Continued from page 31)

The quality of flying was again very high. Many of the modelers I spoke to related that float flying has become standard fare on their weekend outings, and quite a few are flying full-time off the water! Watching the vertical rolls, snaps, top hats and the like, you could easily forget that, just a couple of years ago, the consensus was that floatplanes didn't perform well. Clearlake, and a dozen other float meets across the country, has changed that perception forever. Floatplanes can do it all! The only difference is that the runway sometimes rolls and pitches!

For those of you who want to experience this floatplane mecca, the '92 meet will be held on Friday, Saturday and Sunday over Mothers' Day weekend, and at the end of this report, I've included the phone numbers of people you can call for information. An important note: the motels and lodges begin taking reservations in January, and it's wise to make plans early.

(Continued on page 64)

by Air, Land, or Sea

Amphibian and Flying Boat Set-Up and Operation

by BILL PRICE

A beautiful setting for a beautiful airplane; everybody loves the Catalina. It's a mild-mannered twin because the parasol wing allows the engines to sit closer to the center line.

MANY TIMES, I've been asked how hard it is to fly off water. A surprising number of modelers seem to think that there must be some magic involved, but I actually find it much easier than flying off land. Consider this: when you land on a lake, you have more than 50 acres. How many runways have that much room?

From time to time, I hear people say that water is as hard as a brick. Last time I drank some it seemed pretty soft! The point is that as you go faster, water gets "harder". My planes have taken off, stalled and gone straight in, cartwheeling through the water—and behold! —not a scratch. I've yet to get a water scratch on one of

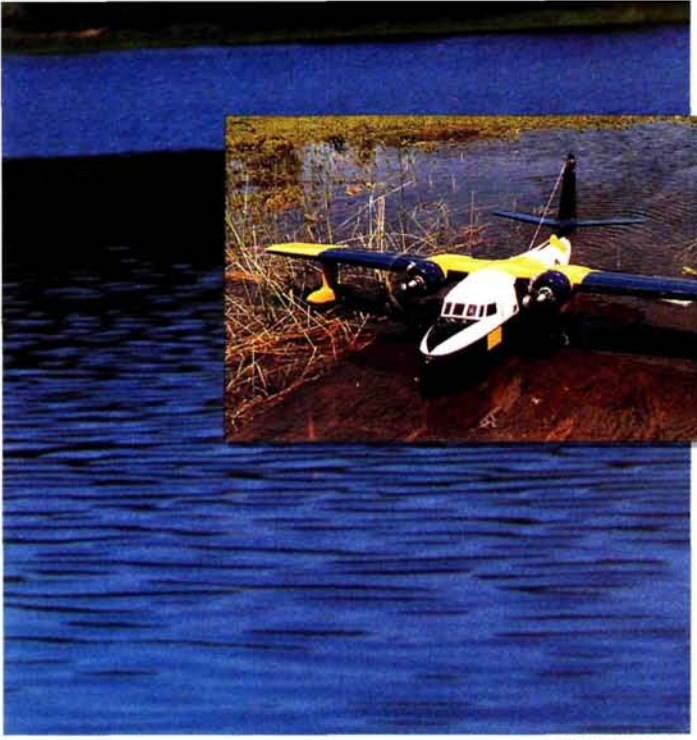
When this aircraft was developed, Canada's forest industry was Canada's economy. Back in December '63, senior fire-fighting officers of the Forest Fire Protection Committee of Canada's National Research Council met in Ottawa to set down design parameters for a close-support aerial firefighter/bomber to combat the increasing threat of fire and to save lives, both human and animal.

The Canadian government had been using converted WW II bombers. Everything from B-17s, B-26s (the A-26s's wartime designation), B-24s, Grumman Tigercats and TBMs to Avengers and Lockheed Neptunes fought the fiery battle. But something different was needed; something designed from the ground up for a specific role—a totally new breed of airplane.

These are the specifications that the Council came up with for a twin-engine amphibian:

- capable of scooping up 800 to 1,500 gallons of water from a mile-long body of water without stopping
- have a takeoff run of less than 3,000 feet
- have a cruising speed of 140 to 150 knots and a stall speed of 60 to 70 knots
- able to withstand 3 Gs
- have excellent visibility from the cockpit
- be adaptable to other roles (to enhance cost-effectiveness).

The Canadair CL-215 fulfills all these requirements and more. It can



Grumman HU-16 B Albatross taxies out of water and onto the tarmac.

"STEPPING UP" TO THIS INTRIGUING NEW WORLD OF MODELING IS EASIER THAN YOU THINK.

PHOTOS BY BILL PRICE

my planes! If you keep your speed down, you'll suffer little damage in a crash.

When I talk to fellow fliers, they ask all kinds of questions about the peculiarities of flying boats; they especially want to know how to make the landing gear work and how to keep water out. This article addresses these questions.

LANDING GEAR

Making amphibious landing gear is a tricky project. The key is to avoid anything that will work through or become detached from the hull and allow water to enter. I designed my amphibians so that their landing mechanisms are mounted on the outside of the fuselage in the wheel wells, which are built into the hull. Only the mounting bolts and air lines go through the hull, and the holes can be sealed with silicone glue.

Designing the landing gear and the fuselage will always be easier if you tackle the landing gear first, the wheel wells second, and then design the fuselage to accept the assembly. If you look at the drawings of the Albatross landing gear, you'll see that if the wheel well isn't designed and installed correctly, it simply won't work.

When I began to design amphibious landing gear, it soon became obvious that there's not a lot of "off-the-shelf"

scoop up its 12,000-pound load in 6-foot seas! It's a record holder, too: a Yugoslavian CL-215 once made 225 drops in a single day, putting down 317,540 fire-choking gallons of water. A CL-215 operating in Quebec made an astounding 31 drops in one hour—one drop every 1 minute, 55 seconds!

Fighting the Inferno

Though the CL-215 has proven to be an incredibly efficient, accurate fire-fighting water-bomber, it also plays other roles. With its removable port and starboard tanks (each having separate bomb-bay doors), the CL-215 adeptly performs transport, crop-spraying and rescue missions, and that makes it that much more cost-effective.

Today, the Canadair CL-215 continues to fight the inferno in the old R-2800 Double Wasp version and the advanced CL-215T turbo-prop configuration. The CL-215T is powered by Pratt & Whitney PW 100s and other updates, but the design is basically unchanged, except for the addition of winglets and secondary vertical stabilizers.

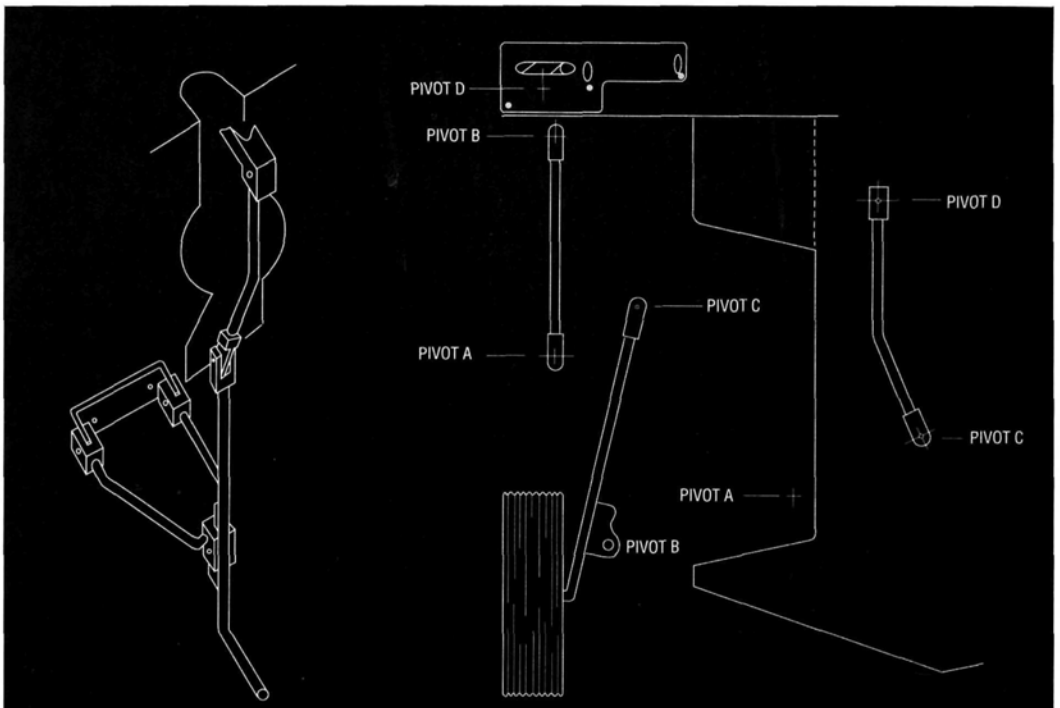
Even though the CL-215 has a modern price tag, it's infinitely more effective than the old converted warbirds. Though fire fighting with old iron warbirds might seem more appealing, what happened on the ground was far from romantic. Untold acres of plants and wildlife thrive today because of the Canadair CL-215.

hardware from which to choose. This necessitates either designing the gear from scratch, or using parts of existing gear hardware to get the job done. A landing-gear system has two basic components: the load-carrying mechanism and the power-actuation system. I rejected jack-screw systems because of the tremendous amount of work involved and because they're very heavy.

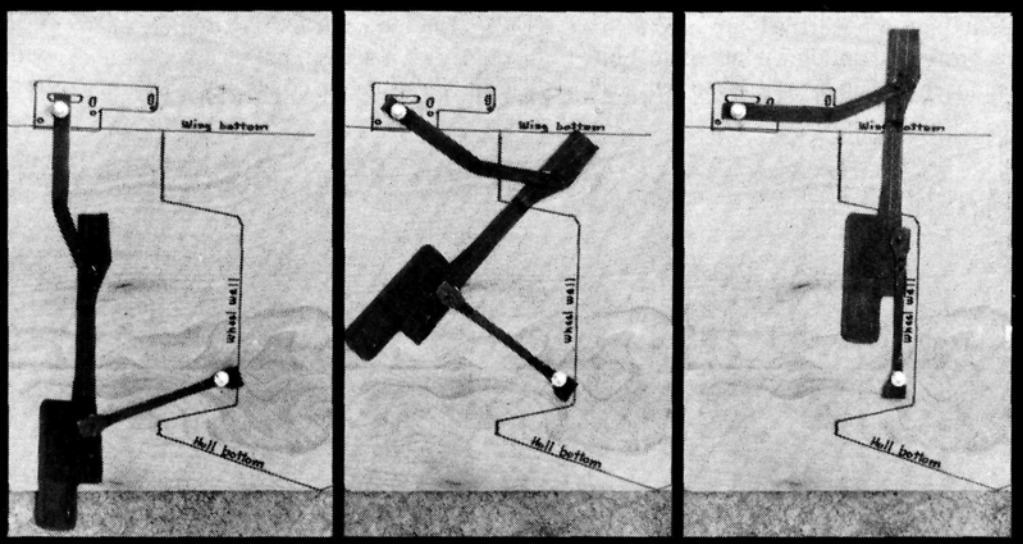
I watched others use the servo-actuated type. With this gear, there isn't usually enough room in the retractable gear area to mount servos; there are all kinds of goofy angles to deal with; and, as always, water is a problem. I didn't put servos in my PBY's wings because of the radio interference associated with running long servo leads to the wing tips. My only alternative was a pneumatically operated landing-gear system. It provides a good deal of water resistance; requires only one or two air lines to actuate; and, in the case of the Spring Air system, provides an automatic extension if pressure is lost.

Next, I designed and built the prototypes. After "sketching around" for a while, it occurred to me that I should make wood-and-cardboard models of my ideas. First, I drew a full-size cross-section of the fuselage on a piece of 1/8-inch plywood. Next, I drew the wheel (actual size), the axle and the lower strut on a piece of cardboard. I then cut 1/2-inch-wide cardboard strips to the length I thought the pivot arms would be, and I used thumbtacks to pin the strips onto the fuselage's profile in the approximate places where they would be on a full-size aircraft. At the points where the arms join the lower strut, I inserted the thumbtacks from the bottom so that the tack's heads would slide on the plywood.

The photos show the setup that I made for the Albatross gear. This is quick to make, gives you a scale-like model of the system, and all that needs to be done to determine the dimensions is to measure from thumb tack to thumb tack for the part lengths. I machined articulating joints as shown in the isometric drawing, and then I silver-soldered them onto 5/32-inch piano wire to make the struts. I'm currently working on a 9-foot PBY, and the scale landing gear will be powered by Robart air cylinders.



The construction of amphibian landing gear consists of basically simple parts, but component placement, arm bends and lengths are critical. These two views of the Albatross gear can be applied to many amphibious models for fabricating scratch-built retract units.



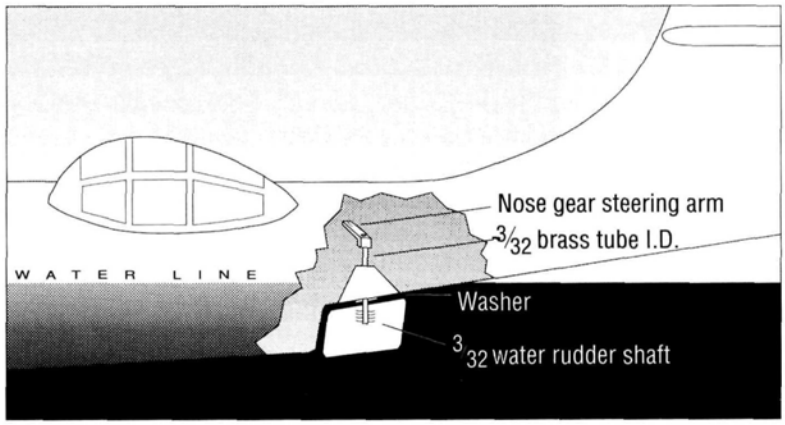
To scratch-build landing gear for an amphibian, it 's best to first make a full-size working mock-up out of plywood and cardboard. Here, the Grumman Albatross landing gear sequence is checked in model form. (See text.)

ABOUT AMPHIBIANS

A flying boat is just that. The fuselage is usually shaped like a boat, at least in the front. Another component of the hull is the step, which is usually located near the CG to provide hydroplaning capabilities and the ability to rotate for liftoff. Because the hull is in the water, it's very important to seal it. My remedy is very sophisticated: I place a sponge under a rubber band that's fastened to the bottom of the hull *on* the CG. Imagine my terror when I flew one of my first PBYs with a half-pint of water sloshing around inside the hull. When I pulled the nose up, the water ran to the back, and it became tail-heavy. When I pointed the nose down, the water ran forward and it became nose-heavy. I was all over the sky trying to control pitch!

Another little problem can occur if you have water inside the fuselage: it can wet

a connector and cause the servo to shut down. I once had to land my PBY with rudder only because the aileron connector was wet. Fortunately, when it quit, the aileron's control was in neutral. It's very handy to have a 3/16-inch hole drilled somewhere above the water line so that you can drain water out without having to remove the wing or hatches.



Water rudder details for out-of-the-water tail-section hulls like the one on the Consolidated PBY.

WATERPROOFING

To keep water out of the hull, run a line of silicone glue around the surfaces to be sealed, put wax paper on the bottom part, and bolt the two pieces together. This will make a custom-fit seal that can be improved after the glue has dried if you put a thin film of petroleum jelly on the join.

I install water rudders on all of my amphibians, and I construct them as shown in the drawing. When I build a flying boat, I always waterproof all the surfaces. As an amphibian accelerates, it rotates its nose up as it gets up onto step. This brings the tail down, and quite a bit of spray can go up over it. Be sure to seal the edges of the MonoKote well, and overlap the seams at least 1/4 inch.

Test your hull in the bathtub to ensure that it's sealed. I've found that when I join fiberglass hull halves, the bond tape tends to suck resin out of the joint, and this causes leaks. Sometimes, these leaks are a pain because the water enters at one point and exits to the inside of the hull at another point. To prevent this, run a small line of resin along the joint so it fills the crack, let it cure, and then add the bonding tape with resin. After you've finished water flying, be sure to spray the retractable landing-gear system with WD-40 to prevent rusting and corrosion of the gear parts.

FLYING

Landing amphibians isn't difficult. The PBY should be landed with just a little power. It makes the controls more effective, especially the elevator and rudder. Hold the aircraft just off the water until near the stall; then, holding full up-elevator, cut the power and let it settle onto the water.

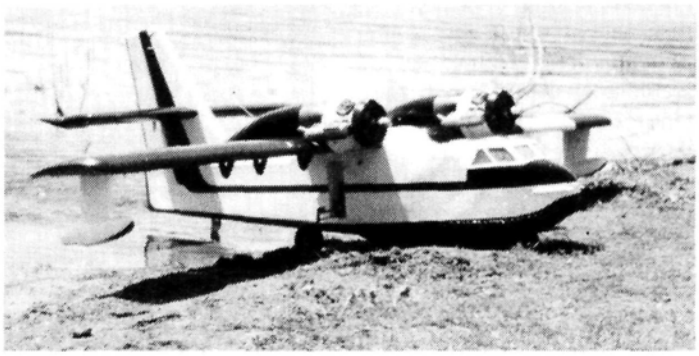
With the Albatross, as soon as it touches the water, release the elevator to neutral to avoid "porpoising." The Canadair needs 15 to 20 percent more power. The Canadair is an extremely efficient flying machine, but its boxy fuselage and large engine cowls, nacelles and tail group cause drag. Without power, this machine comes down! The Canadair's bow is more blunt than that on the PBY and the Albatross, and it doesn't skip off the water as easily as the other planes. Keep feeding in up-elevator until the plane sinks onto the water; keep the elevator in the up position and the nose high. If the plane is allowed to come down too quickly, it will plant its nose straight into the water.

Takeoffs are slightly different in that the wings should be kept level on the takeoff run to prevent the wing floats from digging into the waves. It takes concentration to keep the plane going in the proper direction while keeping the wheels level. This is the only real trick to flying an amphibian rather than a "land" plane, and it's only a concern during the first part of the takeoff run, because as speed picks up, the floats tend to skip off the water and the wing keeps itself level.

I was pleased to find that flying twins wasn't nearly as difficult as I had imagined. The biggest problem is just plain old intimidation. If you follow a few flying rules, a twin can live a long time. I put 55 flights on my first PBY before I retired it. Two cautions about props: wooden ones will be destroyed instantly if they hit water spray; and three-blade props are inefficient on these twin amphibians. It's easiest to get up on step with 9x6 two-blade props, because they cut through the water spray much better. The Albatross won't get up on step with three-blade props, but it jumps right up with 9x6 two-blades and ASP .46s.

I was always intrigued by the PBY Catalina, and after I had built one, I went on to explore other amphibians. It seems that every week I hear about—or see—another amphibian. The subjects for modeling these flying boats are nearly endless. So many planes and so little time (sigh) ! ■

Canadair CL-215 taxiing to shore.



Canadair CL-215 taxiing out of the water.

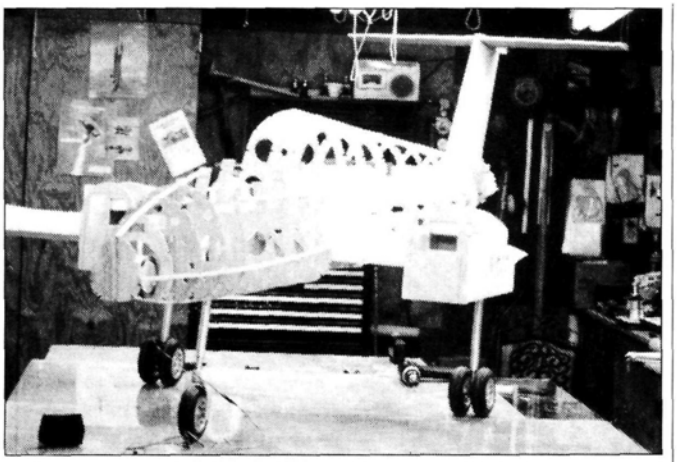
SPORTY SCALE

TECHNIQUES

by FRANK TIANO

Scratch-building: a closer look

I'LL TRY very hard this month to clear up many of the mysteries, misunderstandings, misconceptions and myths concerning the process of scratch-building. First, let's clear up the meaning of the very phrase, "scratch-building". Long ago, the term simply meant that the builder designed his own model, cut out every one of his own parts and built his own airplane, totally by himself. Over the years, "scratch-built" has come to refer to any airplane that was built from something other than a prefabricated kit—usually a set of plans accompanied by a few hard-to-make parts. I realize that many of us will not agree with this new interpretation of the word "scratch-building," but this is what it has come to, and this is the aspect of scale modeling I'll address.

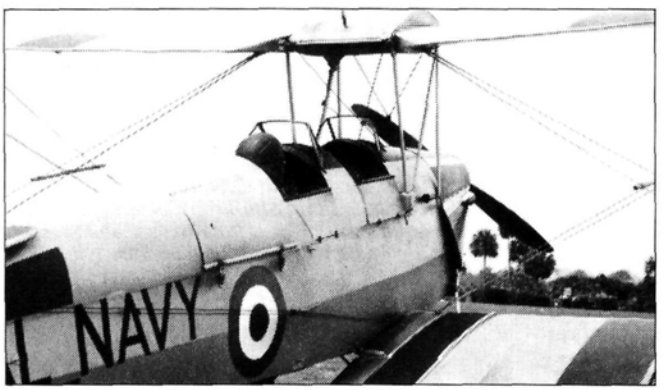


John Morgan took Frank's old Pucara, blew it up to 125 inches and started a labor of love. The photo shows some of its basic construction. I promise to give you more information as John supplies it. It will be powered by two Sachs 3.2 engines, and its projected weight is 39 pounds.

We start by purchasing a set of plans, usually from someone who advertises in the pages of this and other magazines. Remember, all designers will say that their plans are "right-on" and lofted from drawings found under Wilbur Wright's mattress and signed by a Donny Douglas or Larry Lockheed himself! Don't worry about how accurate the plans are until you measure them against a good three-view drawing; and as we said a long time ago, try to remember to ask the designer which three-view he used so that your airplane, too, will match up in all respects. Also keep in mind that if you do find an area that seems out of shape, you're very fortunate to be dealing with balsa wood or the new space age "hobby wood", not pieces of cold-rolled steel and cast iron. In other words, you can easily reshape the malformed part. Whichever three-view you choose, don't stray from it, *ever*, during the construction of your model. Judges will award outline points, or take them away, based on how well you matched *your* three-view, not one they remember seeing in *Model Airplane News* a few months ago.

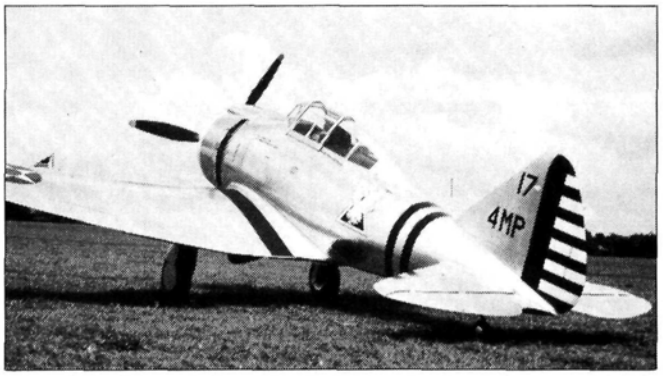
CUTTING UP

OK, we've got our drawings of our subject airplane, we know exactly which version we're building and we're ready to start cutting out parts. There are several ways to cut out parts for your new model. You may make copies of the parts on a copy machine, paste the paper to the balsa with a 3M contact cement or Spray Mount, and cut them out one part at a time. Or, you may cut the original from the plan, paste it to two sheets of wood that have been pinned together, and carefully, with a brand new no. 11 X-Acto blade, cut two parts at the same time. In the case of a



This plane is now offered as a kit, yes, but the first one had to be scratch-built! Fred Beard's magnificent Tiger Moth is a real treat for the eyes. The more you look, the more you see!

A Ziroli Stuka built from plans'n'parts on display at Top Gun. Note the canopy work. It's hard to believe that it's merely clear plastic and some aluminum tape, isn't it?*

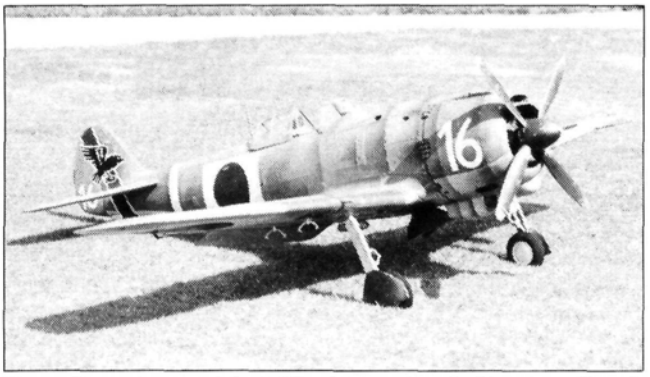


Colonel Art Johnson's beeuutifull P-35 in natural metal was completely scratch-built. Aluminum panels are overlappped from rear to front to resist peeling, just like the full-size aircraft! Learn how to paint those markings next month!

constant-chord wing, you may stack pre-cut rectangles of balsa or hobby wood and cut several ribs at one time on a band saw. Those of us with a Kryptonite credit card can send the plans off to one of those fabulous parts- cutting outfits we read about all the time and get our parts cut for us. This does, however, any secret building hints we should be let in on? Of course, if it appears that the tail just doesn't look right mounted under the exhaust stacks, we can always call back later.

WHICH WOOD?

Selecting the proper wood for the proper location is very important. Try to use



Wayne Siewert's scratch-built "Frank" from Don Smith plans. He only bought the cowl and the canopy; he made everything else from "scratch"—amazing what one can do with little bits of metal, cloth, tape and wire!*

start to alter the meaning of scratch building! After our parts are cut, we must decide on a method to build the framework. Let's hope that we were astute enough when we ordered the plans to ask the designer a couple of very important (to us) things: one, did he ever build one of his own airplanes; two, are there the very lightest wood for all areas aft of the wing's trailing edge. You can buy some great light wood, commonly called "contest grade" from a couple of companies. I personally do not know of any company other than Lone Star Models* or Sig Mfg.* that offers quality light wood. There are several balsa wood companies that offer excellent regular-grade wood; Midwest*, Lone Star and Sig are three of the most popular. The harder, straight-grained sheets of wood are always used for wing ribs. Never use contest wood for wing ribs; you're just asking for trouble.

Mr. Technicality himself, Bob Underwood, found time after those long, grueling days at AMA headquarters to scratch-build a magnificent Russian bomber. Bob is one of only a few AMA representatives who are very active in our sport.

It's OK for stab and fin/rudder construction, though. The same goes for bulkheads (formers)—try to use a stiff piece of wood. Now, I'm not saying a heavy piece, just one that doesn't flex and crack along its grain at the least little pressure. Light plywood, such as Mighty Lite*, can be used on all formers and ribs that require extra strength or support additional weight. Don't use light plywood where you'll have to bolt or screw major components to the airframe. Servo mounts are fine, landing-gear ribs are OK, wing-saddle reinforcements are acceptable; but firewalls, landing-gear mounts and wing hold-down pieces are best if they're fashioned from regular five-ply aircraft-grade plywood or hardwood such as maple. Never use pine or basswood for landing gear or engine-mounting bearers. The best way to get perfect parts is to cut them close to the drawn line, and then finish-sand them to the exact size.

THICK OR THIN SKINS?

After all your parts are cut, decide which part of the model you wish to tackle first. Construct every piece of the model as if it were a model all by itself. In other words, treat the stabilizer as if you were building a kit of only a

(Continued on page 93)

All four of these airplanes were scratch-built. Corvin Miller's Swift is from his own drawings; the Stuka is from Ziroli; Wild Bill McCallie's P-40 is from Jerry Bates' Plans; and Art Johnson's P-35 is from his own loftings. Fifty-nine percent of the Top Gun field was scratch-built—from original or purchased plans!*

SMALL STEPS

FLIGHT QUIRKS AND BOOK WORKS

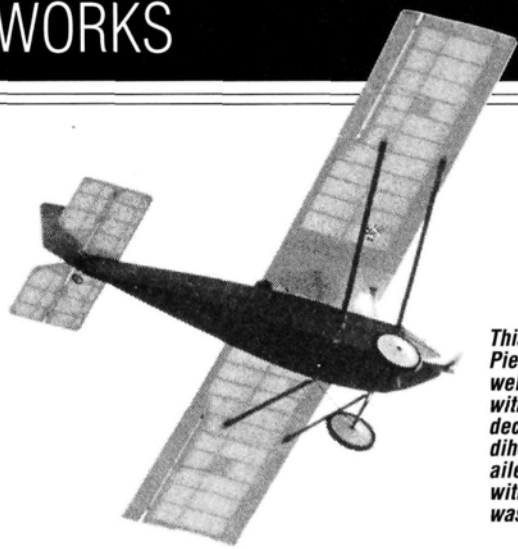
by JOE WAGNER

Pilots of "big" R/C models claim that small, light airplanes are "squirrelly." Though I hate to admit it, sometimes they're right. I've seen and heard from several readers about mini-R/C models that fight their controls and never seem to fly level steadily.

Aside from tail-heaviness, the most common cause of this trouble seems to be excessive decalage, i.e., too big a difference between the wing's and the stabilizer's angle of incidence. Old-time, free-flight models, or rubber-powered scale airplanes that have been adapted for small-engine R/C usually have 3 to 5 degrees positive angle of attack in the wing when the stabilizer is at zero. You see the same thing in many of the older high-wing R/C models; Sterling's Esquire and Berkeley's Bootstraps are good examples.

It's true that you can trim an R/C model to fly with quite an angular difference between the wing and the stabilizer. If, however, there's noticeable elevator deflection in level flight (e.g., some "down" to compensate for excessive wing incidence), then the airplane is going to behave differently as its airspeed varies.

Say you have your model trimmed with down elevator to fly level at part throttle. With more power, the greater airspeed plus the higher-velocity prop slip-stream will combine to make the down elevator more effective. True, the wing lift also increases, but the wing's location close to the CG makes its "leverage" minimal. The tail moment is far more powerful, and the result is a gradually increasing nose-down tendency—maybe even a dive.



This .20-powered Pietenpol flies well hands-off, with zero decalage and no dihedral. The ailerons are set with a slight washout.

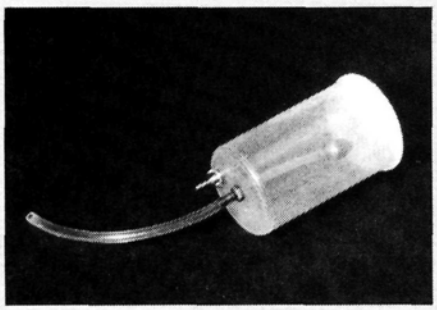
The best way to set up a schoolyard-type R/C model is with just one or two degrees positive incidence in the wing, measured from the center of the leading-edge radius to the center of the trailing-edge radius. (On many lifting airfoils, such as the Clark "Y," if their bottom surfaces are at zero degrees, the true angle of attack is 1 or 2 degrees positive.) Then, balance the airplane as if it were a free flighter so it glides well with no elevator deflection.

Angling the engine thrust line can make a difference, too. I use about 5 degrees down and 3 or 4 degrees right thrust on my high-wing planes. This makes the models fly essentially the same, whether the power is on or off. (I like to glide around for a while after the engine quits, and practically all my landings are deadstick.)

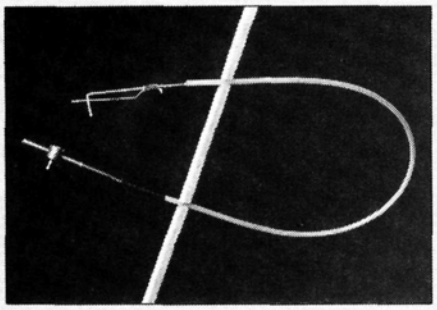
Because my airplanes are light, they climb under high power. That's normal: full-size, light planes do the same. If I want to reduce climb, I push in some down trim; after the engine quits, I return to neutral or even a

CLEVER CREATIONS

Harry Stewart, of Nevada City, CA, has sent me samples of two of his ingenious innovations for lightweight R/C. One is a fuel tank made out of a 35mm plastic film canister; the other is the smallest and lightest flexible pushrod arrangement I've ever seen. Adaptations like Harry's do a lot to keep the weight and the cost of mini-R/C to a minimum; they're a challenge to work out, too! If you have any neat tricks of this sort, let Randy or me know about 'em!



Harry Stewart's neat 1/2A fuel tank (made out of a 35mm film canister) holds 1.1 fluid ounces.



Harry's tiny flex pushrod uses the cable to work the control horn. It's 12 inches long, and it weighs only 2 grams.

smidgen of up to slow the glide. The best thing about setting models up this way is that they're *safe* to fly! There are no evil tricks at various airspeeds, deadstick landings are a cinch, and almost anybody can handle one.

I think that too many R/C fliers want to make this sport tough to learn, maybe to enhance their own "hero pilot" prestige. They recommend high-powered, heavy trainers that are so fast that a novice hardly has time to think before there's trouble and the instructor has to grab the transmitter and take over. That scares the beginner and makes him reluctant to take any risks. Thus, learning R/C becomes a long, drawn-out procedure fraught with peril.

I like my way better: lightweight, slow-flying, obedient R/C airplanes put little strain on the nervous system—or on the budget! ■

PLEASING PLANS

Bill Hannan's plan books contain little text, but they're loaded with photos and plans of unusual models. Enlarging them will provide the basis for some neat, small R/C projects!

Builders and fliers of small R/C models tend to be adventurous in their choice of projects. Much of my "Small Steps" mail contains queries e.g., "Where can I find plans of...?" and, "Can you suggest an unusual model for...?"

My old friend Bill Hannan has written books that contain scads of neat, offbeat, scale, model-airplane plans and drawings. True, these aren't R/C types, but small, rubber-powered or CO_2 projects. Thanks to the miracle of copier enlargement, you can easily convert any of Bill's plans to schoolyard R/C size. Where else could you find drawings of Amelia Earhart's Kinner Canary biplane, or the shortwing Bristol Brownie, or the Evans Volksplane? All of these and more are in the five-volume "Peanuts and Pistachios" set, which I think are all still available from Bill.

Bill has started a new series with a book called "Model Plans and 3-Views International." That's a long name for a thin book, but between its covers are drawings for the Bellanca Skyrocket, the Waterman Mercury racer, the Art Chester Goon and the Nemeth Umbrellaplane, plus a dozen others. Many of these would make great schoolyard scale projects—unusual, yet not hard to build. I think they'd make marvelous R/C fliers!

You can write to Bill at Hannan's Runway, P.O. Box 210, Magalia, CA 95954.

UNIONVILLE HOBBIES

deHavilland Ti

Charm and simplicity in a sport-scale design

SPECIFICATIONS
Type: *Sport-scale biplane*
Wingspan: *51 inches*
Length: *40 inches*
Wing area: *765 square inches*
Weight: *5¼ pounds (not including floats)*
Wing loading: *15.8 ounces per square foot*
Power Req'd: *.30 to .40 2-stroke/.40 to .60 4-stroke*
No. of Channels Req'd: *4 (aileron, throttle, rudder and elevator)*
Sug. Retail Price: *$119.95*
Features: *the kit includes good-quality wood with hand-sawn ribs, a fiberglass cowling, a blow-molded canopy, and two sheets of construction plans. (Construction sequences are printed on the plans.) The model has a simplified cabane strut arrangement; the tail surfaces are made of sheet balsa; and the wing employs a strong D-tube section.*
Comments: *three modifications were made to the model, but these were the modeler's choice, and they're not required; the stock configuration is fine. The cabane struts were changed from a rubber-band hold-down to a bolt-on installation; a wedge of balsa was used to smooth the transition from the box fuselage section to the open stick frame aft of the fuselage section; and a plywood plate was installed behind the trailing edge of the wing to accommodate the rear attachment struts for the floats. With a Fox .40 engine,the model took off without effort at half throttle. Its flight characteristics are similar to those of the .25 Goldberg Eaglet. The Tiger Moth looks great in the air and on its floats!*

I'M NOSTALGIC. Less sensitive types see nostalgia as a wistful yearning for something past or irrecoverable, but I see it as remembering things worthwhile—even things worth reviving. In the area of aviation pioneering, Canada may well be the "nostalgia" leader. To listen to some of their stories, you'd think that there's a rotting parachute harness hanging from half the trees in all the provinces!

Mike Johnson (left) and Ray Simone ready Ray's Unionville Hobbies .40 Tiger Moth. In rough air, this little sport-scale ship can slug it out with the best of them.

Three incidents started me on this trip down memory lane: an offer from Joe Murray of Unionville Hobbies* to provide any one of his kits for review; an offhand remark by Ray

PIONEER

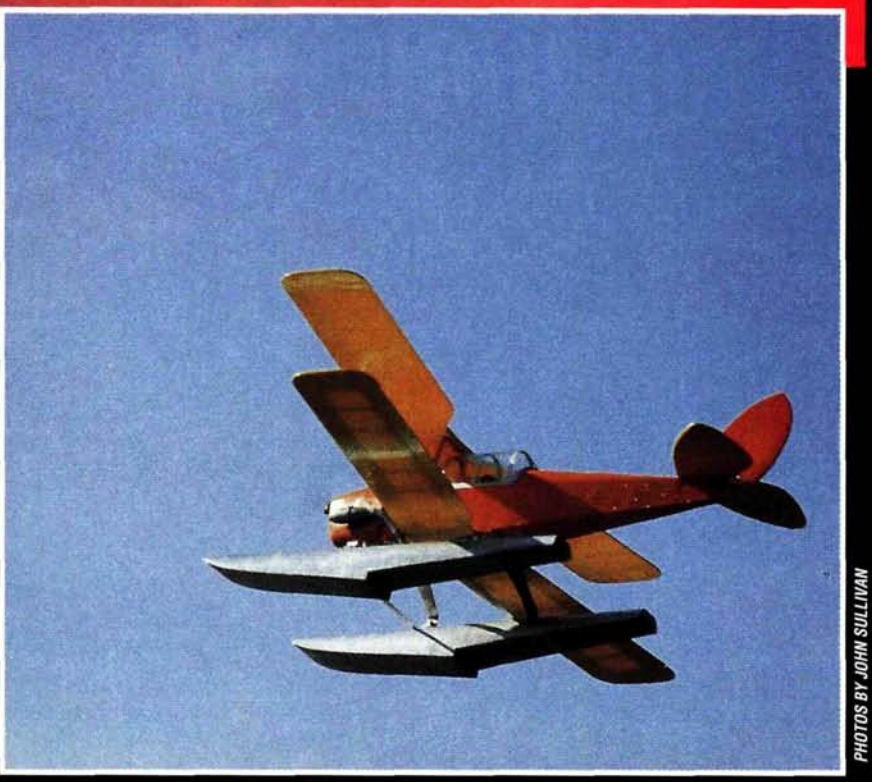
The deHavilland Tiger Moth descended from a long line of deHavilland biplanes—particularly from the famous 60 Moth of 1925. A design problem (poor access to the front cockpit owing to the placement of the upper wing's cabane struts) was improved on the Tiger Moth. The struts were placed forward of the cockpit, and this led to the Tiger Moth's characteristic swept-back wings, which kept the aircraft's center of gravity in the proper location.

The 82 Tiger Moth prototype first flew on October 26, 1931, and it was soon recognized by the British military for its toughness and agility. Its wingspan was 29 feet, 4 inches; it was 23 feet, 11 inches long; and it was powered by a 130hp deHavilland Gipsy Major engine. The Tiger Moth's maximum speed of 109mph gave it a range of about 300 miles, and its maximum takeoff weight

by GERRY YARRISH

r Moth

by JOHN SULLIVAN



PHOTOS BY JOHN SULLIVAN

Coming and going, the Tiger Moth has an unmistakable outline. Wing struts, wing tank, cables and designation numbers will be added after break-in and final testing.

Simone, a local float flier, that he was considering "one of the old biplanes" as his next project; and a letter from Marvin Combs of Alberta, Canada. Marvin knew many of the men who first explored Canada's wilderness, and, every so often, he sends me packets filled with remembrances, tales of various exploits sprinkled with personal insights, and the inevitable obituaries that follow great lifetimes.

So, what we have here is a kit review of a .40 deHavilland Tiger Moth seaplane. The kit arrived from Ontario in eight days, and Ray Simone came over to pick it up eight minutes after I called him! We went over the kit together and found fine balsa stock, a very well-made fiberglass cowl and blow-molded canopy, hand-sawn ribs, various small parts and two plan sheets with the construction sequence printed along the top. This is a sport-scale ship with a practical approach to cabane arrangements, wing attachment, etc. Although you might anticipate difficulties when you build a scale bipe, if you've framed up a couple trainers, I think you'll find nothing intimidating about this kit.

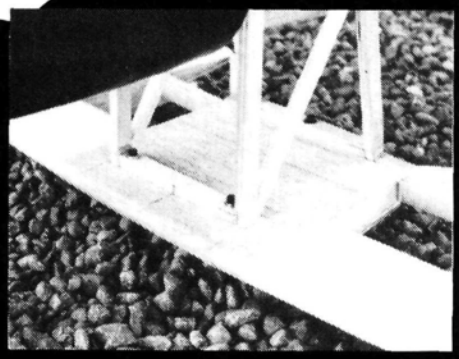
VITH WINGS

was 1,770 pounds. More than 4,000 were delivered to the RAF, and many found their way to Australia, New Zealand and Canada.

The Tiger Moth seaplane was "born" in Canada, and it played a major role in pioneering the wilderness. For Canada's colder winters, a greenhouse canopy was developed, and this feature improved the pilot's comfort and extended the aircraft's role. Mated with floats, the plane had a rugged, purposeful appearance. The deHavilland 82A seaplane is still flying today, and it's a beautiful sight, whether it's on the wing or parked, atop its floats, next to the docks.

The Canadian version of the deHavilland Tiger Moth sported a greenhouse canopy for all-weather flying. (Photo courtesy of EDO Float Co.)

Tiger Moth



In this shot, the top wing has been inverted to show the revised cabane system that eliminated the rubber-band wing hold-down rails. Cross-bracing has been glued and pinned to the cabane verticals, and 4-40 cap screws secure the cross-braces to the fiberglassed center section.

My suspicions concerning ease of building were confirmed two weeks later, when I called Ray and he told me that the Tiger Moth was already framed up! The only bad news was that Ray had become so involved in the construction that he had neglected to order all the items he needed to complete the Tiger Moth. So, while he waited for a ball-bearing Fox .40*, a Futaba* 4-channel radio, MonoKote* and pushrods, he concentrated on details and float construction.

The Tiger Moth kit is a land version, but, with the addition of a ply plate, a duplicate gear blank, floats and a water rudder, the kit can be built as a floatplane. Ray made three modifications to the airframe:

- When it's built to the plans, the Tiger Moth has two parallel beams glued across the cabane tops. This allows you to mount the top wing with rubber bands. Ray turned the beams crosswise, installed T-nuts behind the bottom center sheeting and installed the wing with socket-head cap screws. This clean system has already endured heavy abuse.
- Certain areas at the juncture of the box fuselage and the stick-framed rear fuselage needed wedge-shaped balsa scraps to smooth the transition between the two surfaces. *No* mention of this is made on the plans, but I'm not criticizing because it only takes two seconds to figure out what to do.
- For the third modification, Ray installed a 1/8-inch ply plate just behind the bottom wing cutout to catch a rear landing gear for floats.

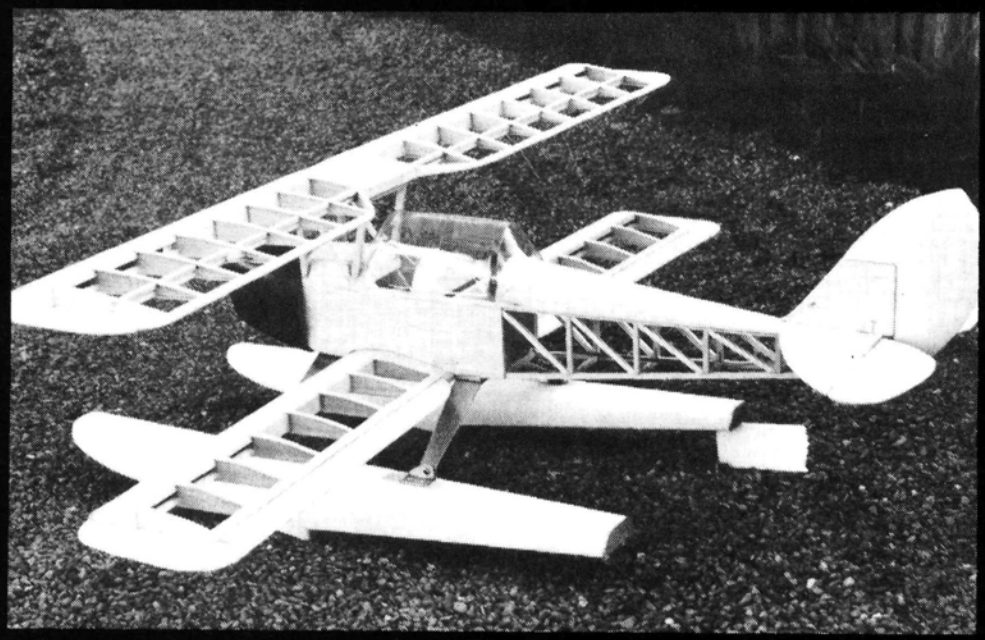
With radio, covering and engine still in transit, I donated a set of 32-inch Sullivan* floats to the project and Ray installed the float hard points, rounded the hull chines, epoxy glassed the floats with 6-ounce cloth, and shot them with white primer. At this point, we took the bare-bones shots that accompany this article. This is very standard stuff: 1/4-inch sheet balsa tail feathers, a top deck with sheeting over formers, and D-tube wings. The largest single components are the 51 1/2-inch-span wings, so for most of the project, you can sit comfortably at your work table and enjoy building.

FINAL PHASES

At this point, the long-awaited equipment arrived, and Ray plunged into the final phases of the Tiger Moth's construction. About a week's spare time was spent installing the engine, tank, radio and pushrods, and another week on covering, break-in and "all the other things we never think of."

Five weeks of spare time (from the box to the lake) for a sport-scale Tiger Moth *on floats* isn't too

(Continued on page 103)



This bare-bones shot of Ray Simone's Tiger Moth reveals the kit's straightforward design. The aluminum rear gear is a scratch-built copy of the kit-supplied front gear. The 32-inch Sullivan floats have been glassed and primed. Note the vacu-formed canopy and the fiberglass cowl.

CLEARLAKE

(Continued from page 46)

Once again, our special thanks to the Clearlake Modelers, the Renegades, and the City of Lakeport. Your dedication, support, hospitality and kindness first nurtured, then became a hallmark of R/C float flying, and we wish you continued success!

**For more information on Clearlake '92, call:*
Wally Rinker *(707) 263-6909.*
Bill Gresham *(707) 998-3952.*
Art Young *(707) 994-6402.*
Lakeport Chamber of Commerce *(707) 263-5092.* ■

2 UGLY

(Continued from page 42)

them down while the glue is drying or the skins will warp.

With a band saw, cut out the bottom outlines with the steps about 3/8-inch too long. Next, cut off the steps and save them. It's even a good idea to mark these pieces so that you can match them later with their own floats. Then, cut out the 1/4-inch notches for the strut blocks, notch two 1/2x33-inch lite-ply hard backs, and

(Continued on page 67)

Using Carbon-Fiber Rods

by GREG POPPEL & JOHN JUNDT

For better control and increased strength

The two outer carbon-fiber rods are hollow; the center rod is solid. Carbon-fiber rods are available in a wide variety of sizes.

QUESTION: WHY DO you need carbon-fiber rods? Answer: *flex!* Carbon fiber rods don't flex as much as other types of rods and cables. Therefore, carbon-fiber rods allow true elevator movement under pressure, i.e., the movement of the control surface isn't distorted by unwanted flexing in your control rod. Carbon-fiber rods also reduce the possibility of flutter when your plane is flying at high speeds.

Carbon fiber rods don't flex as much as other types of rods and cables.

PUSHRODS

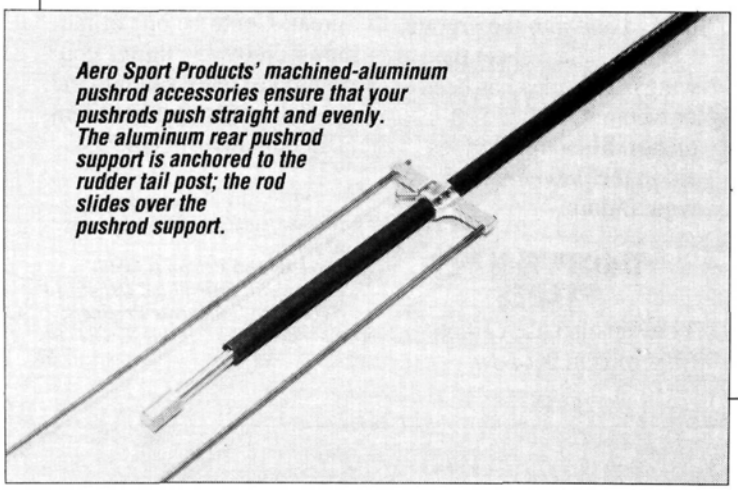
Yes, it's possible that you've been using carbon-fiber rods and haven't known it! For example, Dave Brown Products* offers pushrods that use carbon fiber. Aerospace Composite Products* makes carbon-fiber rods, both solid and hollow, in a large variety of useful sizes.

The most commonly used carbon-fiber rod is the hollow elevator pushrod (see photo). There are a million-and-one ways to set up your control linkage system. Dave Brown Products offers a plastic plug that can be used to attach the metal-threaded pushrod connector(s) for either a straight single rod or a split pushrod elevator system. It's all included in the package. You could also epoxy a small length of dowel rod into one end of the hollow carbon-fiber rod and then drill a hole into which you can thread the metal-threaded pushrod wire (apply a thin coat of CA to the inside of the hole in the dowel to ensure that the threaded wire will be anchored firmly).

I prefer to use the new carbon-fiber pushrod method from Aero Sport Products*. This is set up for split elevators using a machined-aluminum support that guarantees both rods push straight and evenly—a hot setup!

PLUG-IN STABS

Carbon-fiber rods are also used frequently for plug-in stabs on pattern and 1/4-scale planes. You use a hollow carbon-fiber rod for fuselage and stab inserts, and slide a solid connecting rod into the hollow rods to anchor the whole assembly



Aero Sport Products' machined-aluminum pushrod accessories ensure that your pushrods push straight and evenly. The aluminum rear pushrod support is anchored to the rudder tail post; the rod slides over the pushrod support.

Using Carbon-Fiber Rods

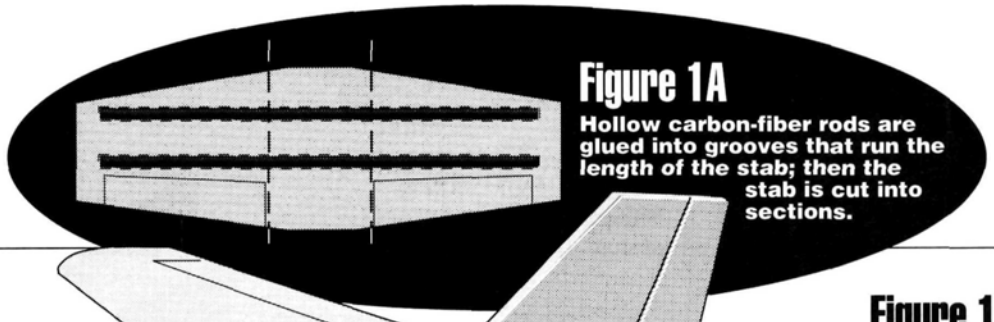


Figure 1A
Hollow carbon-fiber rods are glued into grooves that run the length of the stab; then the stab is cut into sections.

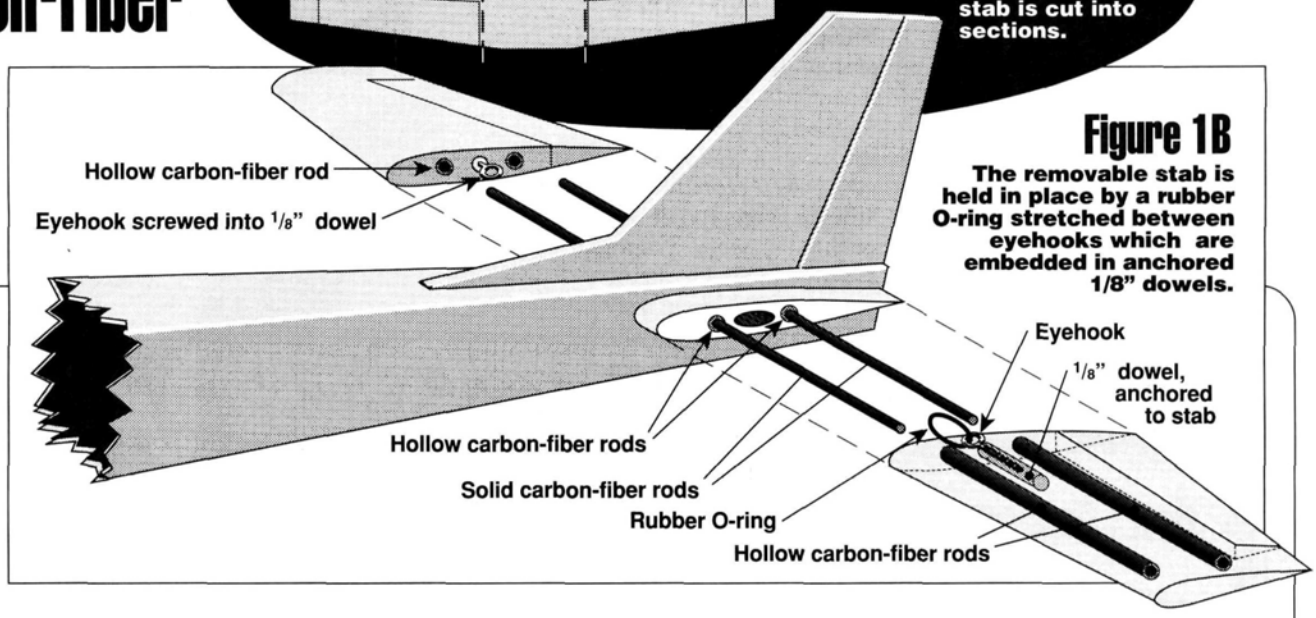


Figure 1B
The removable stab is held in place by a rubber O-ring stretched between eyehooks which are embedded in anchored 1/8" dowels.

(Figure 1). Build the stab in one piece and use a router to rout out two grooves parallel with and about 20 percent of the chord from the leading and trailing edges. Lay a larger hollow rod in each groove and epoxy it into place (be careful not to get epoxy in the holes at the end of the carbon-fiber rods!). Fill in any remaining space in the groove with a solid piece of lightweight balsa, and sand to shape.

Next, cut out the stab center (the piece that will nest in the fuselage) with a band saw. Cut this center section so that its end pieces will protrude about 1/2 inch from the fuselage sides; then block-sand the edges flat, and glue a 1/16-inch plywood plate to the end pieces to cover the foam interior of the stab section. Glue plates to the end surfaces of the outside stab pieces as well. Now insert the solid carbon-fiber rods into the hollow rods and rejoin the entire stab. Tape the whole assembly together and epoxy it into the stab saddle in the fuselage. This ensures proper alignment of the stab in the fuselage.

BRACING A WING

Another use for carbon-fiber rods is as braces in thin foam or cored-out wings. This provides enough strength to withstand almost anything you could give it in a rigorous flight. I learned about this technique from the "glider boys."

We used a Dremel tool to rout out a groove in the wing (Figure 2). It doesn't matter if you use the top or the bottom of the wing. Put the rod in the groove (solid or hollow rod, although hollow is recommended, as it saves weight). Then spread a little epoxy over the rod and into the groove. Let it dry, then sheet the wings. This idea has been proven in Quickee 500 planes. It's a tremendous aid in the prevention of wing failure.

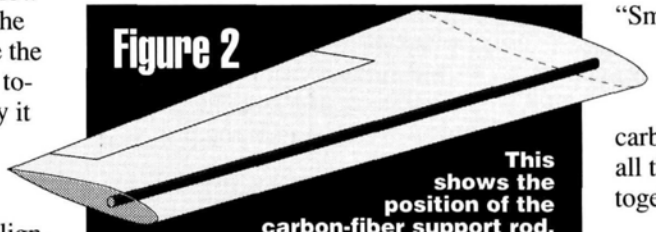


Figure 2
This shows the position of the carbon-fiber support rod, which protects against wing failure.

"TRICK" FUN-FLY PLANES

You can also use carbon-fiber rods in the new "trick" fun-fly airplanes. They use a larger, hollow, carbon-fiber rod for a "boom" that serves as the fuselage! I know that you've seen them, e.g., the "Yard Dart," the "Smith Special" and the "Schtick." Well, the carbon-fiber rod is all that holds them together!

COMBAT AIRCRAFT

Last, but not least, a bulletin just in from "R/C Central": people are using carbon-fiber rods as leading edges in their bats! Humm!!! Yes, I said *bats*. They're back and they're great! Could be one of the most enjoyable things you can do to relax and unwind.

Till next time! Fuel 'em, flip 'em and fly 'em!

**Here are the addresses of the companies mentioned in this article:*
Dave Brown Products, *4560 Layhigh Rd., Hamilton, OH 45013.*
Aerospace Composite Products, *P.O. Box 16621, Irvine, CA 92714.* ■

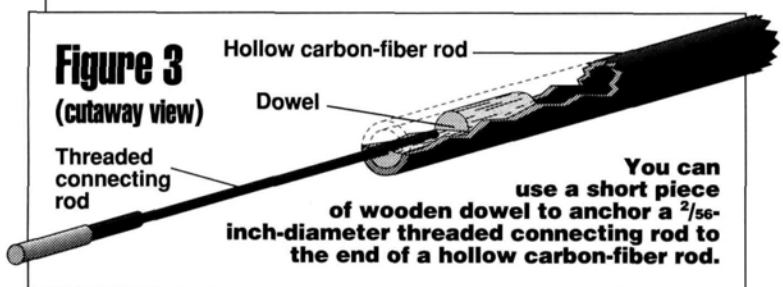


Figure 3
(cutaway view)
You can use a short piece of wooden dowel to anchor a 2/56-inch-diameter threaded connecting rod to the end of a hollow carbon-fiber rod.

2 UGLY

(Continued from page 64)

install them with white glue. Install the strut blocks and the transom block. Glass the floats with 1 1/2-ounce cloth. Attach the 1/64-inch plywood center bottoms with epoxy, and add the steps with their transoms. Install another piece of 1/64-inch plywood (over the steps only) and glass the fronts once more. Suck around all the edges to see if there are any air leaks, and add resin until you can't suck any more air. Attach the stabilizing fins, and you've finished. These floats should weigh about 7 ounces each.

STRUT ASSEMBLY

There are several ways to make the struts. The simplest is to make them out of .063x3/4-inch aluminum strap material and secure them to the fuselage and floats with 1/4-inch, no. 20 nylon screws going into tapped holes. The photos show wire struts soldered in a jig. I use this method because I'm familiar with it, not because it's better. You can have your choice here!

(Continued on page 78)

Perfect for the first-time giant-scaler

Above: Stinger in knife-edge flight. Note effectiveness of large rudder. Photos above and right were taken at Top Gun '91.

Below: Author's Stinger on takeoff roll. The huge rudder is appreciated in crosswind conditions.

by MICHAEL SMITH

LANIER

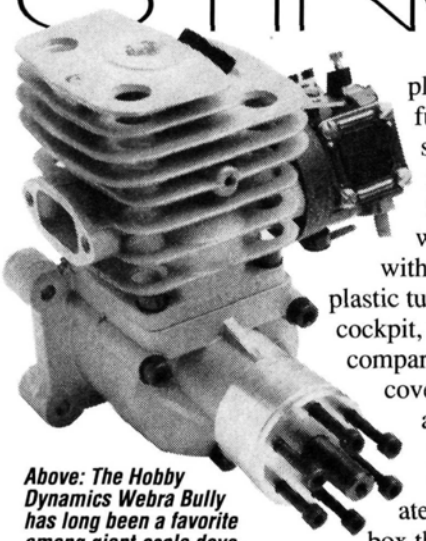
STINGER

THE ADVERTISEMENT says, "Experience an awesome flying machine!" I was curious to find out whether Lanier's* definition of "awesome" and mine were the same and, after a week of spending what little spare time I had, I found out.

THE KIT

The box that arrived at my door could conceivably have housed a coffin or a small Japanese import. This box was *huge!* After opening it and inventorying the contents, I knew why. Some of the nicest things about this kit are the one-piece,

STINGER



Above: The Hobby Dynamics Webra Bully has long been a favorite among giant-scale devotees. The author converted his to glow operation using a conversion kit from Innovative Model Products. The kit includes a new carburetor that markedly improves throttle response and top-end performance.

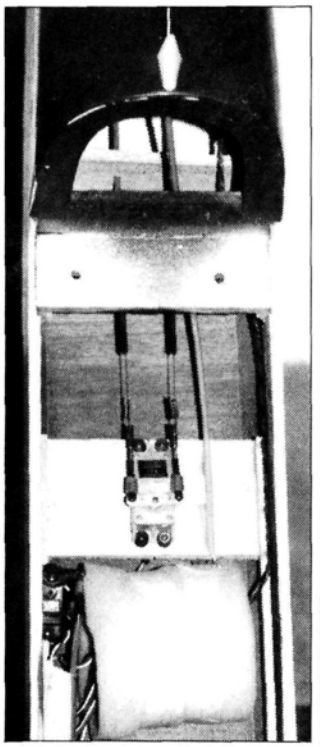
plywood fuselage sides. Seeing the foam wing-cores with the ABS plastic turtle deck, cockpit, fuel-tank compartment cover, cowl and wheel pants, I appreciated why a box this size is needed.

The kit arrived in excellent shape, and everything that was supposed to be in the box was there. The wood was of good to excellent quality and packaged in bundles for each stage of construction. The vacu-formed parts were excellent, and the complete plans and excellent instructions are easy to read and understand.

As advertised, the kit doesn't come with any hardware, but the only hardware needed was 4-40 pushrods and clevises, miscellaneous wood screws, a giant-scale tailwheel assembly, a pair of 3/16 axles, tires and the necessary empennage bracing wires. A quick trip to the hobby shop provided two rolls of white Solartex (a fabric-type iron-on covering), a spinner, a tube of PFM (an adhesive from Innovative Model Products*) and some decals.

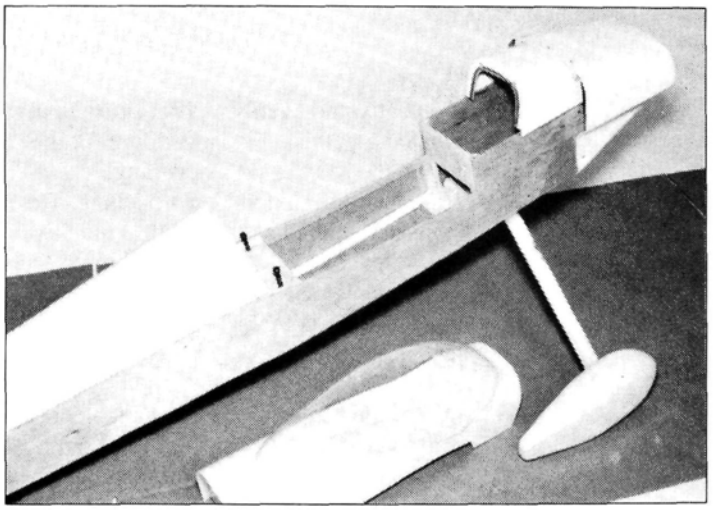
CONSTRUCTION

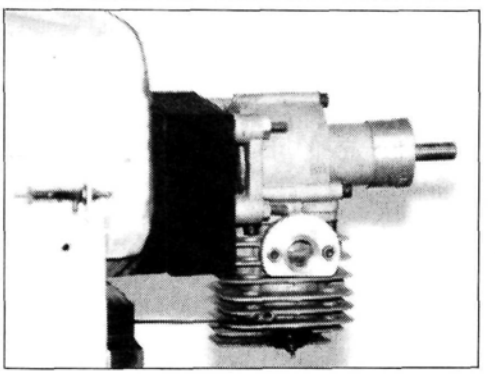
I read the instruction book completely and carefully, then, just for kicks, I called



Right: Because of its small size, the Webra Bully is set out from the firewall on two 2x4-inch pieces of stock. Larger engines won't need this treatment. Note the remote needle valve; it's from Innovative Products, which also offers a glow conversion for the Bully.

Left: Equipped with a pull/pull system, the rudder servo was mounted in the fuselage center section to reduce tail weight and compensate for the lightness of the Webra Bully.



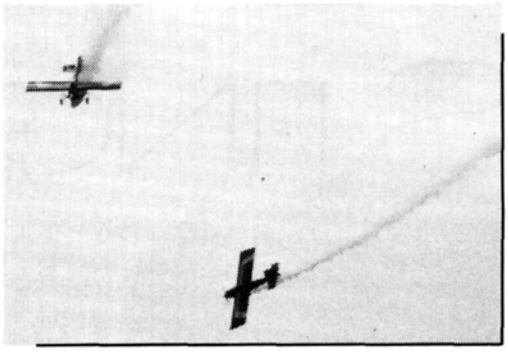


Above: The fuselage after the ABS plastic turtle deck, the tank cover, the cockpit/wing cover, the wheel pants and the cowl had been installed. These vacu-formed parts greatly speed construction. The trim lines on the plastic parts proved to be accurate.

SPECIFICATIONS

Type: Giant-scale aerobatic
Length: 52 1/2 inches
Wingspan: 84 inches
Weight: 14 to 20 pounds
Wing Area: 1,596 square inches
Wing Loading: 20.2 to 28.8 ounces per square foot
Power Req'd: 1.5 to 4.2ci 2-stroke
No. of Channels Req'd: 4 (rudder, elevator, ailerons and motor)
Sug. Retail Price: $299.95
Features: the Stinger has a vacu-formed, turtle deck, wing and fuel-tank cover, ABS cowling and wheel pants, partially sheeted foam wing with balsa spars, and heavy-duty aluminum landing gear. Its low parts count makes it quick to assemble.
Comments: Wayne Voyles and Bubba Spivey are to be commended for designing and producing an easy-to-build, giant-scale aerobatic plane with great slow-flight characteristics and superb Aresti stunt capabilities. The kit doesn't include hardware, but those who prefer to choose their own will consider this a plus. If you don't use a big, heavy engine like a Zenoah G62, keep things light in the tail so that you'll need little or no nose weight.

STINGER

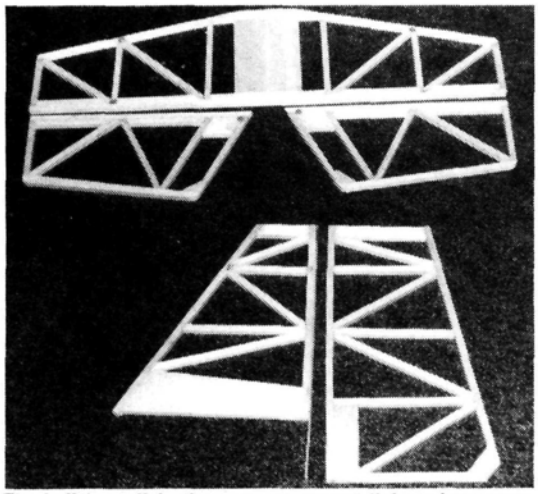


Bubba at Lanier R/C and asked him what power and which prop he preferred for the model. He recommended the Zenoah* G-62 and a 22x6-10 propeller. He said that the model could be built in five days, figuring about two hours a night. I decided to try it.

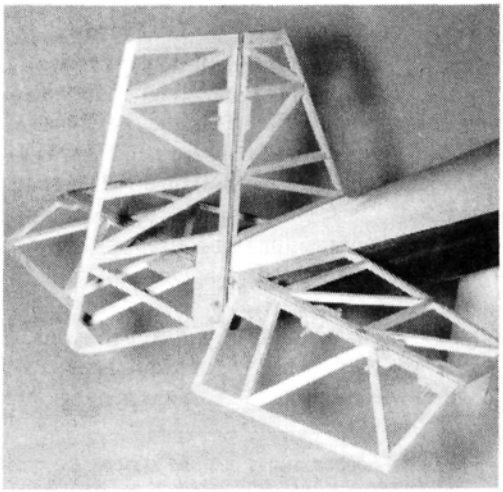
• **Wings.** I started with the wings. The foam-cores were well-cut. I just sanded them lightly with 220-grit sandpaper and then secured the balsa spars and sheeting. The design incorporates full trailing-edge ailerons. Following my preference, I secured solid stock to both the outer and inner 3 inches of the wing trailing edge and left the rest as control surface. I find this more aesthetically pleasing and, in some models, it can also help reduce the likelihood of flutter.

The design doesn't use full sheeting; instead, balsa cap strips connect the leading-edge sheeting and trailing edge, and this lends a built-up appearance to the wing.

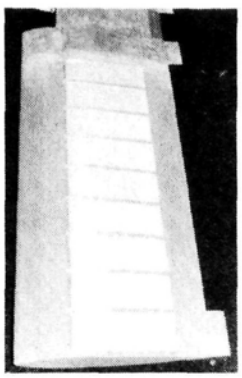
Next, to install the servos, I ran 22-gauge, stranded, servo extension wires from the center of the wing to the servo cutouts. Twisting the wires together is easy: simply clamp the ends of the three wires in a vise and the opposite ends into your drill chuck. Squeeze the trigger on the drill and—voilà!—your cables are neatly and evenly twisted together. Using the heavier gauge wire for extensions can reduce interference.



The built-up tail feathers are strong yet light to keep nose weight down. Their assembly is one of the more complex procedures when building the Stinger, but it's still easy, enjoyable and far from time-consuming.



You can see how the union of balsa and ABS vacu-formed parts makes building easy and gets the model into the air quickly.



The Spectra's wing has a cap-strip construction with leading- and trailing-edge sheeting. The author trimmed the full-length ailerons and installed small stationary inboard and outboard sections. This was his preference—not the result of a design flaw.

The center section of each wing core has the slots already cut for the installation of the center brace and the plywood doubler. Everything fit really well without sanding or trimming. After completing the sheeting, cap stripping and aileron installation for each wing half, I joined the two wing panels. I glassed the center section with 2-ounce fiberglass cloth and polyester resin.

This entire process took me about two-and-a-half hours. That finished my building for the evening.

• **Fuselage.** The next night, I quickly framed up the fuselage. The fuselage sides are of one-piece plywood. Simply setting them out on the table, tack-gluing a couple of formers into place and squaring-up the firewall took only about 15 minutes. After determining that everything was square, I installed the doublers and the triangular reinforcing stock. I next sanded the wing center section and fit it to the fuselage wing saddle. When I cut out all the ABS plastic parts for the fuselage, I found that the cut lines were accurate. I secured the fuel tank cover to the fuselage with PFM and glassed the interior of the fuel-tank compartment. This entire process took only an hour-and-a-half.

The following evening, I built up the empennage. This is done over the plans using the balsa stock provided. Each piece must be cut and fitted, so care must be taken during this process. After covering I went ahead and installed the hinges so that the complete assemblies would be installed in two easy steps.

At this point, I determined that I would use a Webra* Bully for power. Since this engine is considerably lighter than the Zenoah G-62, I knew that it would be advisable for me to limit the weight installed in the airframe's aft section. To save weight, I cut out the holes for the elevator servos in the tail of the fuselage sides. For rudder control, I use a cable pull/pull system with one servo in the fuselage center section.

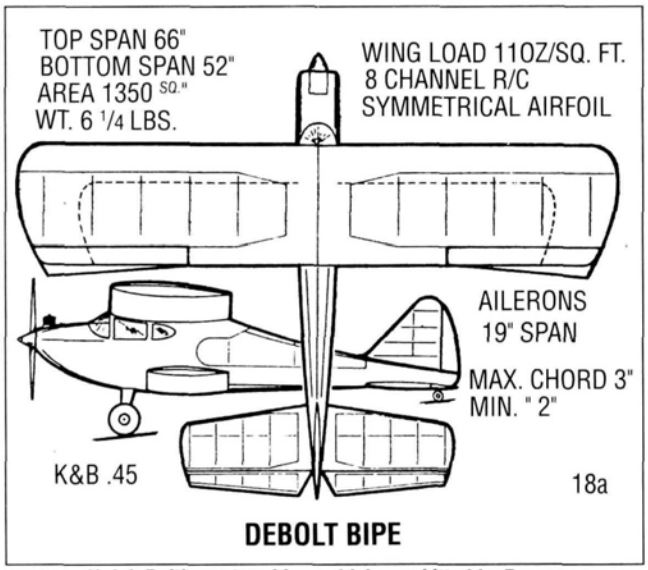
(Continued on page 134)

GOLDEN AGE
OF RADIO CONTROL

by HAL DEBOLT

Early R/C Biplanes

I ENDED LAST month's column with a promise that I'd complete the discussion of early R/C biplanes this time. Their recent popularity and success in competition (notably that of the Ultimate, etc.) makes this discussion timely. I have photos of early two-wingers, and I'll describe them for you.



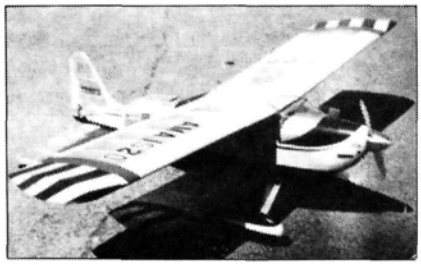
Hal deBolt's custom bipe, which was kitted by Dmeco.

DRAG WAS A DRAG!

I previously gave details about the development of the Live Wire (LW) custom bipe, which was probably the first biplane flown competitively. As people gained experience with the original, minor modifications that brought it to its final form were made.

As you'd expect, with two wings, drag was a constant consideration. Power could be used to overcome it, however, and the release of the new K&B .45 gave modelers a much-appreciated increase in power compared with the original .35. With the switch to the .45, the nose was cleaned up; on the competition versions, it was faired into a spinner.

The increase in power brought a problem: at faster speeds, the lower wing tended to rock span-wise in its saddle, so inter-plane struts were needed. Simple, tensioned, 1/16-inch wire separators were run easily between the two wings and attached with clevises—"no sweat" additions. Thanks to Frank Zaic, we have a nice three-view and a photo of a modified Custom bipe.



This early AMA biplane was developed for pylon racing (see text).

You might think the bipe in the third photo is of more recent origin than the mid-'50s. Actually, it was developed for early AMA pylon racing, in which the planes were flown around two pylons (for time alone). Most of the designs for this event were high-wing or shoulder-wing monoplanes, and the required 720-square-inch wing area made them rather large. It was thought that a much smaller high-wing bipe could be flown, with the smaller lower wing helping the plane to meet the area requirements

Naturally, when pursuing the idea, streamlining was used as far as possible to ensure a sleek look. The pylon bipe's top span was 57 inches, and the lower one was 36 inches to give a wing area of 720 square inches. Weighing 4 1/2 pounds, it was powered by a Fox .19 and controlled by a Bramco 5-channel reed radio. How competitive was it? It did quite well in races, placing second at one Dallas Nats.

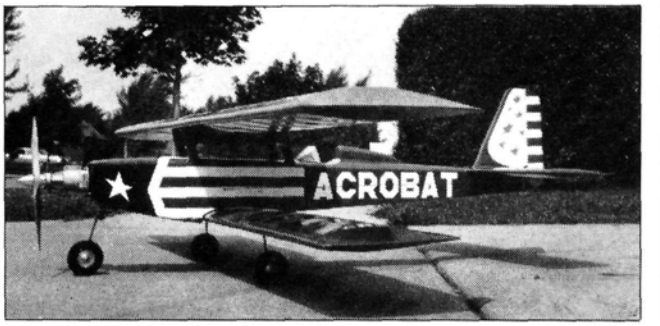
WORLD CHAMP BIPES

Two photos show my FAI bipe, which registered the second highest single flight score at the first World Championships. This design represented a serious attempt to produce the most "flyable" biplane using available equipment. Though low-wing designs

Hal deBolt's FAI biplane was flown in the first World Championships in Zurich.

were showing much promise, most of my experience was with biplanes, and I took a single-winger and a double-winger to the Champs.

Much thought was given to the design of the FAI bipe. The foremost concern was reliable power. I had been having problems with the K&B .45 "flaking out" at critical times. On the other hand, with their ball bearings and ringed pistons, the Super Tigre G35s seemed to last forever. To ensure reliability, the bipe was designed around the .35, so it was smaller than the Custom bipe—about 1,100 square inches.



A Live Wire production Acrobat—the last of the Dmeco biplane kits. Note the absence of dihedral.

Powered by an ST 35 and controlled by a Bramco 5-channel reed radio my FAI bipe weighed 5 pounds. In one photo, it's landing after its single flight in Zurich (where it was dubbed a "dupple decker"!), while in the other, it's 20 years later, and it's in the hands of a member of the Olean, NY, STARS.

CONFIGURATIONS AND CABANE CAPERS

One photo shows the last of my well-known bipes: the prototype LW Acrobat (at a Memphis, TN, flying site in the early '60s). From its appearance, it should be obvious that the Acrobat was the culmination of the LW 24-hour "assembly theme." It was a "quick-build" biplane. Many have asked me why I installed a trike gear on a historic-looking biplane. Well, at that time, it was a concession to the desires of modelers, who had just learned the advantages

(Continued on page 76)

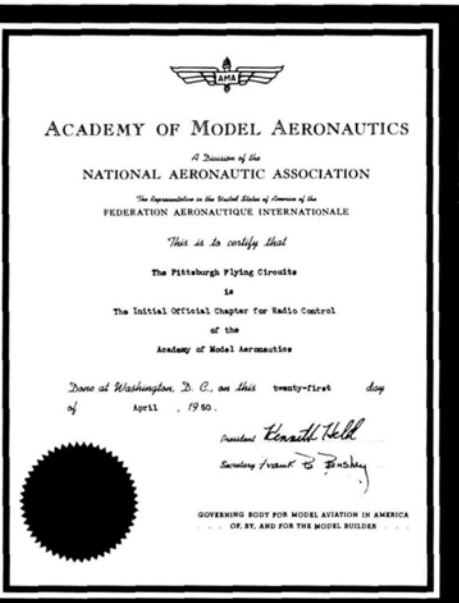
FIRST R/C CLUB —AND THOSE— DRONES

My recent column about the OQ-2A target drones brought some interesting input that included information about the first official AMA R/C chapter.

Fred Collins of Pittsburgh, PA, was part of the drone story with his repro OQ-2A, and he thoughtfully sent us an AMA certificate that declares the "Pittsburgh Flying Circuits" to be the first R/C chapter of the AMA. Dated April 21, 1950, it definitely establishes the first AMA R/C club, but could there have been unofficial ones before then? Any thoughts?

United Airlines Captain Charles Pyealt of Palos Verdes, CA, tells us he recalls the army working with the OQ-2A in '43 and '44. In '63 and '64, he was an instructor on the Aero Jet drone at Yuma, AZ. Powered by a 160hp engine, this R/C drone was rocket-launched and brought down on a parachute. The recovery system was powered by four D-cells and it sometimes worked! The problem turned out to be the false bottoms on the D-cells, and those R/C drones cost Uncle Sam $250,000 each!

Ralph McCraw of Sequim, WA, says he worked for Radio Plane in Van Nuys, CA, from 1946 to 1947 building OQ-2As. They also built some "Wright Flyer" look-alikes for the movie, "Kings Go Forth," which was about John Montgomery—a pilot who supposedly flew 20 years before the Wrights.



ACADEMY OF MODEL AERONAUTICS

A Division of the
NATIONAL AERONAUTIC ASSOCIATION

The Representative in the United States of America of the
FEDERATION AERONAUTIQUE INTERNATIONALE

This is to certify that

The Pittsburgh Flying Circuits

is

The Initial Official Chapter for Radio Control

of the

Academy of Model Aeronautics

Done at Washington, D. C., on this twenty-first *day*
of April , 1950 .

President Howard Hall

Secretary-Treasurer E Bentley

GOVERNING BODY FOR MODEL AVIATION IN AMERICA
. . . OF, BY, AND FOR THE MODEL BUILDER . . .

Fred Collins also tells us that Hugh Maxwell (413 East St. Clare, MI, 45074) has written a definitive history of the early R/C drones. He was a member of a U.S. Navy drone crew during WW II, and he has researched the early versions and written about his experiences with them. This makes fascinating reading, and I hope we see his book in print soon.

Fred also adds interesting tidbits about his OQ-2A. For one thing, you had to fly it a là full scale, coordinating rudder and aileron for turns. (Rudder or aileron alone just gave a "dumb" turn.) The servos for rudder and elevator were in one unit with separate motors and gears for each. There was self-neutralizing for rudder, but no neutral for elevator—just trim. (We R/Cers had already found this to be a catastrophe!) The parachute release was controlled by a solenoid that pulled a pin and simultaneously cut ignition.

We sure have come a long way from there!

GOLDEN AGE

(Continued from page 75)

Hal "Pappy" DeBolt with his Acrobat prototype at a Memphis, TN, flying site in the early '60s. (Note dihedral.)

of three wheels for ground handling. It also seemed to be a good selling point!

With these planes, my major consideration was simplicity of assembly, so typical cabane struts were out of the question. Instead, I made the cabanes an integral part of the plywood forward fuselage sides. This eliminated the need for fussy wiring, and it also ensured proper wing alignment. The plywood cabanes also enabled me to attach the wings with Cam-Loc fasteners instead of the usual bothersome rubber bands.

Despite their simplicity, Acrobats were very competitive in pattern flying, and they certainly proved the worth of bipes. The Acrobats were powered by K&B .40s and controlled by the sensational Space Control radio or the Orbit version of it. With their generous 1,100 square-inch-areas, they were excellent examples of the "fly-on-the-wing concept," and the mediocre .40 power proved ample for all maneuvers. (Note the absence of dihedral—omitted to facilitate assembly, but it proved that bipes didn't need dihedral for stability.)

BOLERO BIPE

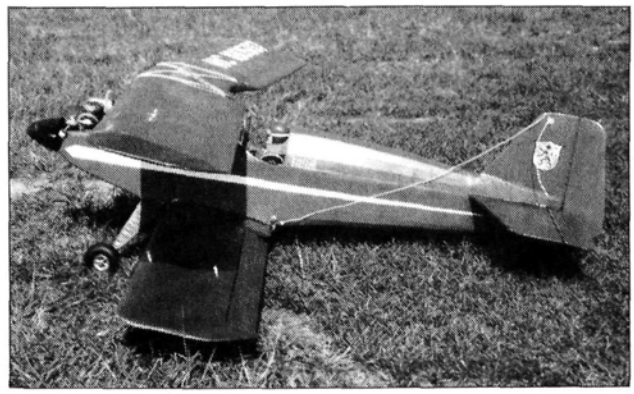
Those of you who are familiar with Lou Proctor and his fabulous R/C kits, e.g., Antics, Nieuports, etc., will know that Lou is always on the leading edge of whatever he does. We're fortunate to have a photograph of one of his lesser-known endeavors—an early biplane. Lou designed this classically beautiful .60-powered "Bolero" in the mid-'60s and, and it's easy to see that it could be considered the acme of bipes, even today. Whatever Lou Proctor does, it's done in championship style!

A discussion of early R/C biplanes wouldn't be complete without mention of Lou Andrew's everlasting "Aeromaster," which is the only one of these early birds still in production today. We've always thought that Lou must have had the big, brute Stearman in mind when he put pencil to paper to design this one. Like the Stearman, the medium-size Aeromaster is a bear of a model with a big, powerful .60 in its nose. Except for its swept wing, it has "Stearman" written all over it. If you were looking for something with a classic biplane appearance, the Aeromaster filled the bill nicely.

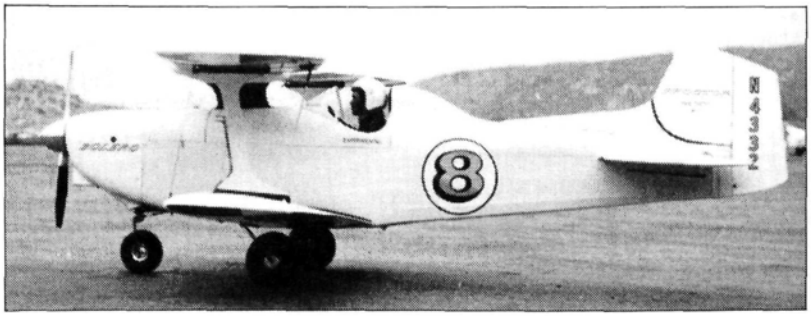
Its appearance was appealing and, in the hands of champion pilots like Ernie Huber, the Aeromaster quickly established its place on the contest circuit. For all its brutishness, it's a docile craft capable of all maneuvers.

The original design has been modified in many ways (see photo). Lou suggested several alternative wings, including "sweep back" in both wings à la Bucker or Ultimate. The most obvious change in appearance is the use of a radial cowl, which makes it look even more like a Stearman.

I hope I've shown you that today's high-performance biplanes have their roots firmly planted in early R/C. Will this early design be the "wave of the future" for aerobatic flying? ■



Lou Andrews' everlasting Aeromaster is still kitted by Great Planes.



Lou Proctor of Proctor Enterprises built his "Bolero" in the mid-'60s. A .60-powered airplane, it was quite a sensation on the West Coast.

2 UGLY

(Continued from page 67)

RADIO/ENGINE INSTALLATION

Wrap the fuel tank in a piece of foam, and install it with the fuel tubes attached. Likewise, wrap the battery pack and push it forward next to the tank. Install your engine, and slide the throttle sleeve between the tank and the battery. Install the mini-throttle servo using a side plate. You'll probably have to angle the servo upward slightly to accommodate the throttle-cable's angle. Just be sure that it clears the wing.

Now install the rudder and elevator servos, and connect the pushrods with Z-bends. Place the radio receiver behind the tank with an aileron extension; this makes attaching the wing easier. The antenna will be fed through the wing tube during attachment.

RIGGING, ASSEMBLY AND FLYING

The only critical rigging is that for the ailerons. They should be set for 3/8 inch up and down on low rate and be aligned so that their top surfaces are flush with the

2 UGLY

rear fuselage. This is the right amount of reflex for the relaxed stability requirement. The elevator should be 1/2 inch up and down on low rate, and on rudder, all you can get.

This ship practically assembles itself! Connect the aileron lead to the receiver, slide the antenna through the wing tube, tighten the three hold-down screws, and you should be ready to fly. For transportation, you can remove the floats, but you probably won't need to.

To fly, you'll use the same techniques as you use for any other float ship. A little aft stick as you start to plane, and then you're off! You'll notice some yaw in the turns owing to the short lateral coupling, but this has a benefit in that the nose is held up as if you were holding top rudder. I've found that a Graupner* 11x7 three-blade prop works very well on my Saito* .50, and I strongly recommend it.

**Here are the addresses of the companies that are mentioned in this article:*
***Balsarite**; distributed by Coverite, 420 Babylon Rd., Hersham, PA 19044.*
***Micafilm**; distributed by Coverite.*
***EZ**; distributed by Hobby Shack, 18480 Bandilier Cir., Fountain Valley, CA 92728.*
***Graupner**; distributed by Hobby Lobby Int'l, 5614 Franklin Pike Cr., Brentwood, TN 37027.*
***Saito**; distributed by United Model Distributors, 301 Holbrook Dr., Wheeling, IL 60090.* ■

GIANT STEPS

(Continued from page 45)

tion, you can easily change wood sizes to suit your perception of the need for additional strength in any plan. Cutting your own strip stock makes things a good deal easier and more convenient.

Where it's necessary to splice long building sticks, make a scarf joint (see sketch) and then back it with a plywood gusset. Naturally, the surfaces of such

(Continued on page 92)

GREAT PLANES

SPECTRA

An award-winning 2-meter glider turns electric

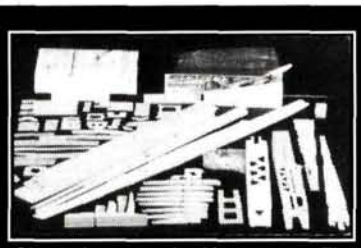
by CLYDE GEIST

PHOTOS BY CLYDE GEIST

WHY SHOULD I want a Great Planes* Spectra electric-powered sailplane? Well, I've built over a dozen electric model airplanes, but none of them was a real sailplane. My friends Rick and Steve scrape the clouds at over 1,200 feet with their electric sailplanes, often flying for more than half an hour on a single battery charge. Gulls circling over our small field enjoy even, modest lift, but not for long: a minute here—coast 200 yards for 2 minutes there—and on it goes. For this style of flying, Steve and Rick tossed the can motors out of their kits and invested in expensive after-market motors. We have to clear high trees 90 yards away and get up into thermals fast.

Enter Spectra—an entry-level sailplane with its award-winning Selig 3010 airfoil that's neither fully flat-bottom nor symmetrical. This kit's motor is a step up from the standard 550 provided by Great Planes. This kit was a pleasure to assemble. The Spectra's flight performance can best be described as stable, yet maneuvers are precise. I consider Spectra the thoroughbred of its class. It's an electrified version of the Spirit sailplane that took first place in the 2-meter class at the 1990 AMA Nationals.

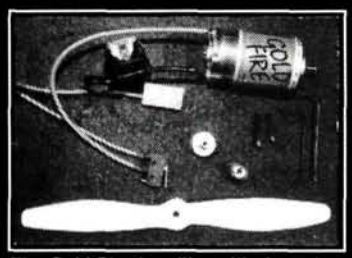
SPECTRA



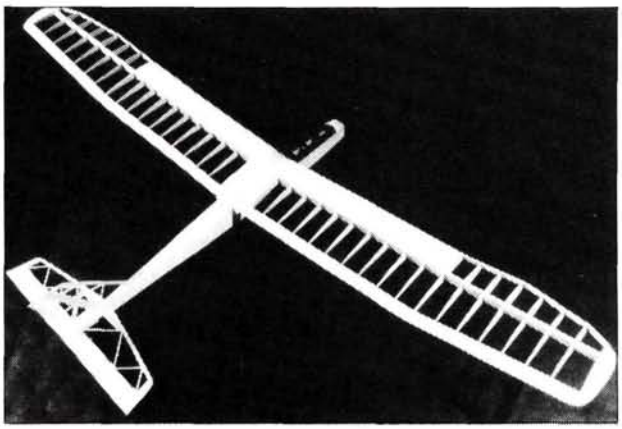
Shown here are the kit contents. The overall quality of the parts was good.

SPECIFICATIONS

Type: Electric Sailplane
Wingspan: 78.5 inches
Length: 42 inches
Wing Area: 676 square inches
Weight: 48 ounces (RTF); 41 ounces as built.
Wing Loading: Nominally 10 ounces per square foot; 8.5 ounces per square foot as flown.
Power Req'd: 6- or 7-cell Ni-Cd battery (800-1700mAh.). Gold Fire 550 Electric Motor included in kit.
No. of Channels Req'd: 3 (motor control, elevator, and rudder)
Sug. Retail Price: $79.95
Features: the kit includes a 550 Gold Fire electric-drive motor.The servo-activated motor control, fuse, arming switch and battery connector are all pre-wired. The leading-and trailing-edge material for the wing is notched, which speeds up construction.
Comments: the Great Planes Spectra is of excellent quality throughout. Despite the fact that the Spectra is marketed as an entry-level kit, advertising claims of high performance in capable hands aren't exaggerated.



The Gold Fire is a "jewel" of an electric power package, and a perfect match for the Spectra.

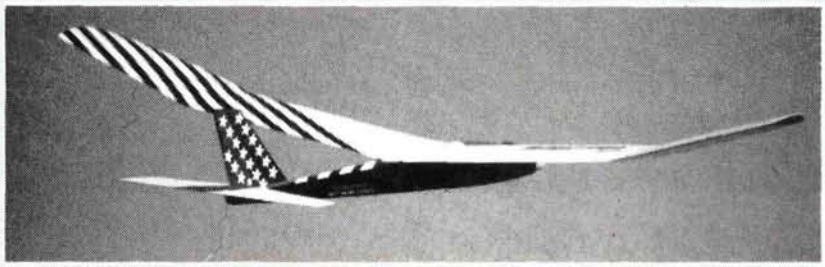


The bare bones of the model show its pleasing lines.

THE KIT

"User-friendly" best describes the neatly packed Spectra kit. Almost every part shows some prefabrication: notched leading and trailing edges, well over 100 precision-die-cut parts and all the required hardware. The instruction manual is aimed at beginners, and it will take you step by step through building. It's more than construction information; it's an electric-model-flying R/C course.

Included is the 550 Gold Fire Motor System, which has a servo-operated motor control, fuse, arming



Extended flight times and improved performance come from reduced weight. Micafilm is lighter and much stronger than most films.

REDUCING WEIGHT TO IMPROVE PERFORMANCE

I've invested up to $95 in microservos for each electric R/C aircraft that I own. They're less powerful, but I save at least 1.5 ounces on each plane. An additional $70 for a receiver trims two more ounces; and $30 for a battery-eliminator circuit cuts powered flight time but saves the weight of receiver batteries. Expensive?—yes, but the dramatic improvement in flight performance can't be disputed.

I was really creative and used a covering that not only saved me an additional 2 ounces, but, as it turns out, was also seven times more tear-resistant than the covering I was using. Coverite's* Micafilm isn't much different from most films in use, except that you'll have to apply Balsarite liquid adhesive to the areas to which you'd like the Micafilm to adhere. This saves weight by putting the adhesive where you need it and not on the entire covered surface. Don't kid yourself about holding strength: with lower heat on my iron, just one coat of Balsarite stuck as well as any heat-activated covering I had ever used.

Brush some Balsarite on the remaining overlaps, allow more than 15 minutes to dry, and iron them flat.

My results? I chose an uncovered wing that weighed exactly 9 ounces. The area of the white opaque covering is about 1,270 square inches (about .985 square yard). Covered with Micafilm, the wing weighs in at 10.6 ounces!

The Balsarite accounts for about .3 to .4 ounce—half the usual weight of my covering. Furthermore, it's so tough that I can't poke my finger through it!

switch and battery connector all pre-wired. Attach the 8x4 propeller, and it's ready to power your Spectra.

CONSTRUCTION

The high-quality die-cut parts require no trimming or filling to achieve a good fit, and the wood is of average weight and consistently good quality. The only adhesives that I used were thick and thin cyanoacrylate (CA).

• **Tail feathers.** Begin assembly with the tail feathers, which incorporate built-up stick construction. The stabilizer is built the same way, except for the solid balsa elevator, which must be trimmed to length.

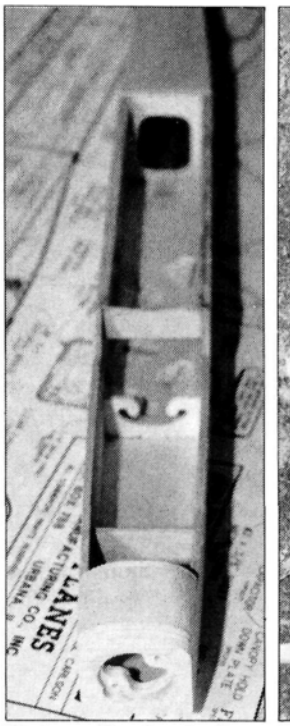
• **The wing.** OK! Choose now: is it a one-piece (easier to build) wing, or the two-piece (easier to transport) wing that I built? The two-piece wing necessitates the use of joiner boxes, which are made by gluing plywood to the front and back of the spars in the center joint area. This area, one bay long, is then sheeted top and bottom with 1/16-inch balsa sheet.

After you've removed the panel from the plan, the outer wing panel pieces go together in a similar way, but the leading edge is notched according to the plan. I thought I attached my wing tip in the way shown on the plan, but after sanding it, I had an elliptical wing tip rather than the 90-degree trailing edge shown on the box. Mounted higher, I'm sure the sharp corner would have remained intact.

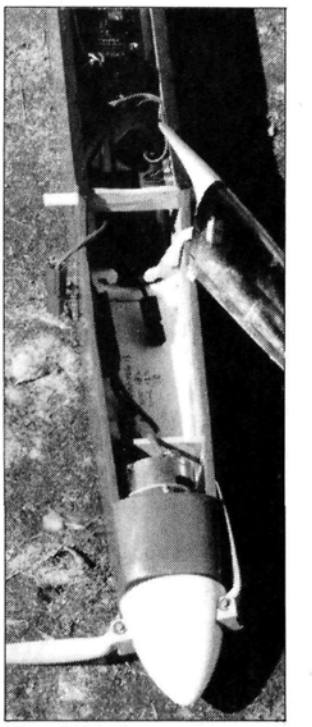
At this point, I prepared the mating wing parts by placing the die-cut spacer under rib 9 and sanding the panel to the proper angle at the edge of my workbench. Checking for a perfect joint without compromising the straightness of the wing took some extra care. The panels are joined at the spar and the leading edge with die-cut braces. Die-cut clamps hold them together until the CA has cured. Installing half ribs completes the joint.

The leading-edge top sheeting is glued while it's flush with the top of the leading edge. Attach plywood wing protectors to the trailing edge to complete the wing.

• **Fuselage.** Begin by attaching two doublers to each side. The two die-cut bottom sections are assembled over the plan and held fast with CA. Plywood bulkheads and formers slip into grooves on the bottom and the sides. The fuselage frame is complete when a solid balsa block with the canopy plate glued to its back is glued into the nose area and sanded to shape.

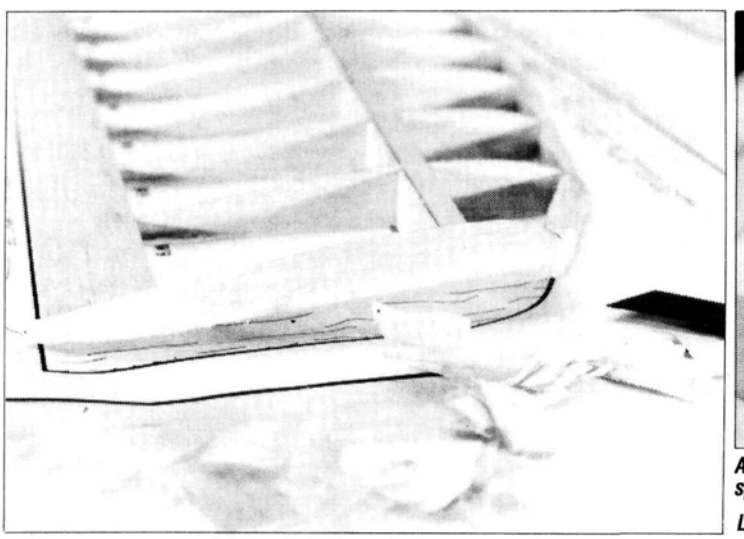


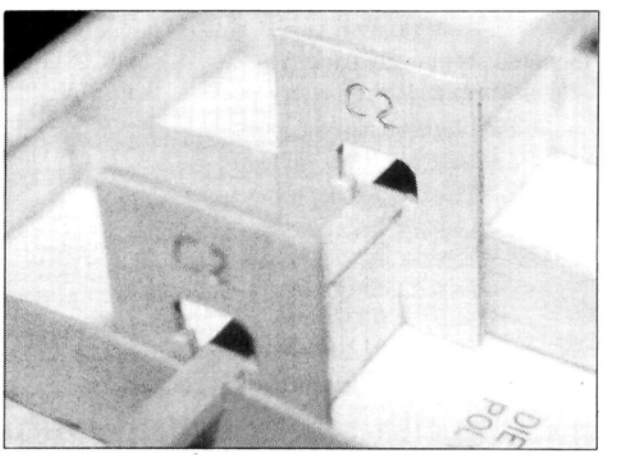
The framed fuselage is shown over the plan.



The MCR-4A receiver and micro-servos fit well. Below them is a SR 1200mAh battery.

• **Die-cut canopy parts.** These are assembled using the fuselage as a former. A 1/8-inch hole is drilled through the canopy front into the nose block to accept the mounting dowel. I trimmed the canopy on the line indicated, but I had to sand the wooden parts for a better fit. Drill 1/8-inch holes through the nose, and

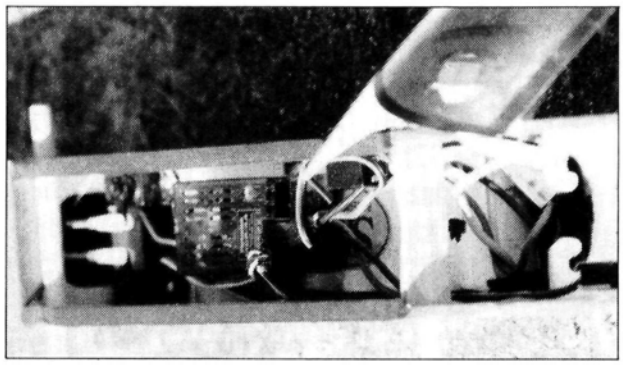




Above: these plywood clamps (included with the kit) simplify and speed up wing construction.

Left: the wing tips are whittled down to shape.

SPECTRA



Despite its trim appearance, the fuselage has plenty of room for equipment. The battery slips in under the wing area.

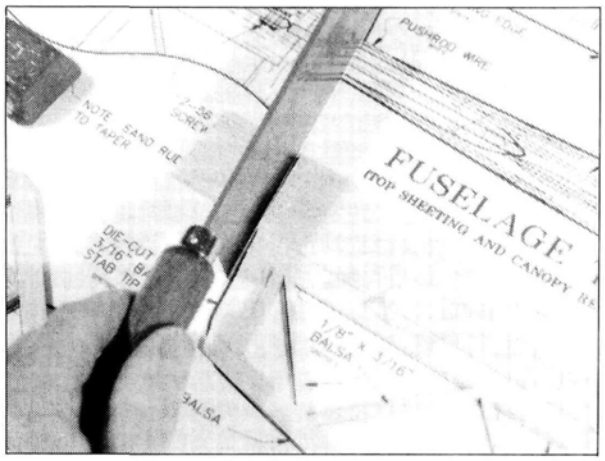
trial-fit the motor to complete all the basic construction.

COVERING AND FINISHING

I chose Micafilm* for the covering (see sidebar), and for the trim, I applied pre-spaced vinyl stars supplied by AMP Graphics*. AMP also supplied my wing-seating tape and self-adhesive vinyl trim material. I applied red stripes to the lighter wing panel to correct lateral balance.

RADIO INSTALLATION

Following the instruction manual's suggestions regarding radio equipment, I chose the Futaba* Attack-E. Its MCR-4A receiver incorporates battery-eliminator circuitry, speed controller and S-33 microservos to save weight and simplify installation. The Spectra kit includes the hardware to attach the rudder and elevator pushrods to their respective servos.



Cutting the elevator to length with a razor saw is quick and easy.

The slotted sides in the Spectra's fuselage that allow you to shift components for balance are a unique feature. Proper balance results when my receiver, servos and 7-cell 1200mAh pack are mounted all the way back. This arrangement places the battery pack exactly under the CG, where it's held in place by Velcro® strips. Other options that I chose were Sermos* connectors and a SonicTronics* folding propeller.

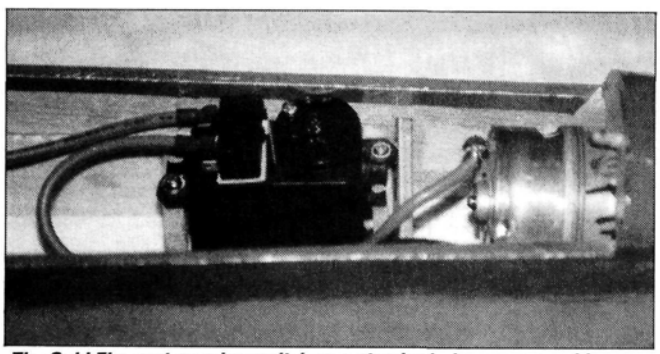
PERFORMANCE

Final preparations included checking control movements and balance. Although it was a bit too windy on my first outing, I attempted one flight. The 8x4 prop turning 11,000rpm propelled the Spectra up at an awesome rate of climb, but my 1200mAh battery died after delivering about 90 seconds of power. Fortunately, I was able to land inside the small flying site without incident, other than a predictably short flight of about three minutes.

A week later, with less wind and a new SonicTronics 7x3 prop, Steve, Rick and I were off to a larger field with our sailplanes. It was mostly a photo session—there was no time for real competition—but comparisons proved that the Spectra glides faster, sinks more slowly and is more maneuverable. After my first flight, which lasted 15 1/2 minutes using an SR* 1000mAh 7-cell battery, an attempt at landing resulted only in a glide across the entire field.

On another day, I launched the Spectra for a 30-second climb. I cut power and lucked into one of the strongest thermals I've ever experienced. Offsetting climb with down-elevator trim, higher air speed provided snappy response, but climbing continued into a cloud at about 1,400 feet. Forward stick brought me upwind of this particular cumulus.

Still climbing, I forced a tight spin, and my Spectra returned once again to a reasonable altitude. A long, sensible glide back to earth allowed me to check first my pulse and then my watch: 21 minutes on a 30-second climb! Despite the fact that Spectra is marketed as an entry-level kit, advertising claims of its potential high performance in capable hands aren't exaggerated. Meantime, when Rick and Steve look for gulls overhead, they aren't surprised to find my Spectra is already there.



The Gold Fire system microswitch on a standard-size servo provides excellent power control.

*Here are the addresses of the companies mentioned in this article.

Great Planes Model Mfg. Co., *P.O. Box 788, Urbana, IL 61801.*

Micafilm; *distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044.*

A.M.P. Graphics, *P.O. Box 793, Deer Park, NY 11729.*

Futaba Corp. of America, *P.O. Box 19767, Irvine, CA 92713-9767.*

Sermos R/C Snap Connectors, *Cedar Corners Station, Box 16787, Stamford, CT 06905.*

SonicTronics; *distributed by SR Batteries, P.O. Box 287, Bellport, NY 11713.*

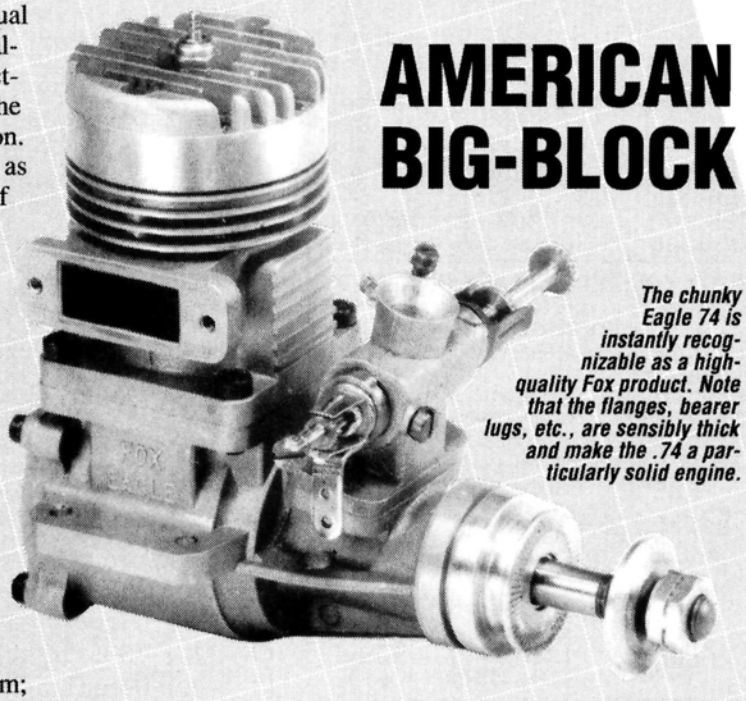
SR Batteries, *P.O. Box 287, Bellport, NY 11713.* ■

ENGINE EVALUATION

by MIKE BILLINTON

FOX EAGLE 74

AMERICAN BIG-BLOCK



The chunky Eagle 74 is instantly recognizable as a high-quality Fox product. Note that the flanges, bearer lugs, etc., are sensibly thick and make the .74 a particularly solid engine.

DESPITE THEIR sometimes unusual appearance, Fox engines have always been solid and functional—reflecting the late Duke Fox's regard for the practicalities of model engine operation. The latest Eagle 4 Series engines are as fitting a tribute to his memory as any of his many other designs. They aren't entirely Schnuerle-ported; their "semi-Schnuerle" design has side transfers that are quite small by current standards, and the main transfer flow is still at the earlier cross-flow position (opposite the exhaust port). Nevertheless, Fox engines are among the most innovative of those made in the USA, and their metallurgic quality is among the best.

ENGINE COMPARISONS

I compared the Eagle 74 with the full ABC/Schnuerle ASP 75: the 74 has a 9.6mm carb, but the ASP's is 11.1mm; Fox recommends 5-percent-nitro fuel, whereas 10 percent is recommended for the ASP; the Eagle 74 has a fairly low soft compression ratio of 8.9:1 (effective) compared with the ASP's 11.8:1; and, finally, despite its less powerful *ringed* piston, the 74's torque and power levels can be favorably compared with those of the ASP (a fine, strong performer with better open-exhaust torque/cc levels than any previous sports engine).

It's surprising that such a rugged-looking engine weighs only 18.9 ounces; it places high in a list of torque/weight ratios (see chart). Only two other engines on the list have comparable values. This ratio is a result of increasing cylinder capacity without increasing engine size. The Eagle 74 has the same cylinder as the Eagle 60, but it has been bored out from .905 inch to 1 inch; the crank and stroke (.938 inch) remain the same.

Increasing cylinder size means an increase in piston weight and restrictions on breathing at higher rpm. This is because the increased engine capacity is fed by throughways and transfer passages of the former size. The Fox Eagle 74 performs much better at medium and low rpm; its running and smoothness of operation deteriorate if it's forced to operate much beyond 16,000rpm.

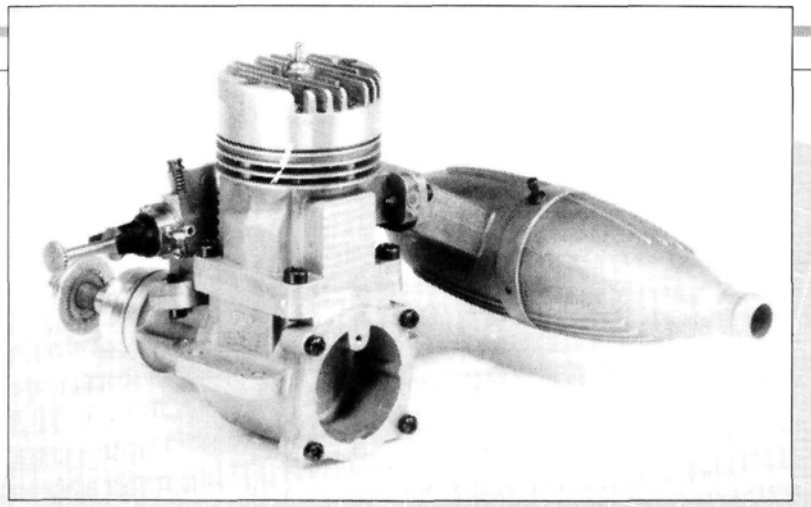
This .74ci sports engine will be used in large-scale aircraft (up to 9-foot span), so fairly large propellers will be essential. Of the test propellers used, the APC 14x8 and MK 13x6 operated at good rpm with the standard muffler fitted. The Eagle 74 is a strong, loud engine, and to meet sound regulations, it will have to be operated at around 9,000rpm or equipped with an after-market muffler—unless measures are taken to quiet its "out-of-the-box" configuration.

Torque/weight ratio:

(Units are ounce inches/pound)

Super Tigre 60cc twin	143
Enya 80 XF	142*
Fox Eagle 74	140*
OPS 80 fan	134
ASP 75 heli	126*
Super Tartan 44cc twin	125
Irvine 46	124*
Saito 80 4-stroke	122*
OPS 60cc twin	121
YS 129 4-stroke	114
Enya R120 4-stroke	108
ASP 61 R/C	107
Enya 60 XF	105
Irvine 40	102
Saito 65 4-stroke	100
Enya V-twin 40cc	99
Super Tartan 20cc	95
Super Tigre 2000	91
Nova-Rossi 3.5cc	86
Kawasaki TA51cc	82

* denotes engine with increased capacity



Both upward- and downward-angled mufflers are available. The tapped hole in the backplate is for the low-pressure crankcase air feed to the fuel tank (if required).

MECHANICAL FEATURES

The cylinders on Fox engines are split horizontally low down, and this allows the upper cylinder assembly to be rotated to one of four exhaust-outlet positions (even forward!). To run-in the engine correctly and ensure that it lasts, it's best to decide on exhaust-outlet position right away and then stick with it. Each Fox Eagle is test-run briefly at the factory (the chances of anyone buying a below-par Fox engine are slim), but if you decide to alter the cylinder's position, you won't harm the engine's piston ring/liner if you've barely started to run it in.

- **The crankshaft** is solid and in one piece, and the crankpin is a large 9/32 inch. The Eagle's crankweb is cut away asymmetrically, partly to balance the induction slot in the crankshaft. This is probably why the Eagle 74 runs very smoothly and free of vibrations at low and medium rpm.
- **Induction timing** is quite small and points to the required low-rpm operation envisaged.
- **Cylinder timings** are also low by some modern standards. Hardened steel is used with a very close-fitting medium-silicon-content aluminum piston and a ferrous ring.
- **Piston clearance** is approximately .001 inch, so extra care in running-in will be rewarded later by a good piston seal and a long engine life. (That's the major reason for the continued use of that technology in this ear of the ABC plain piston.) Fox uses low-expansion, silicon, piston material, so their engines avoid the problems caused earlier by the high-duty/high-thermal-expansion aluminum alloys. Also unusual are the very small Anderton (machined) circlips that hold the wristpin in the piston; removing them is quite a task!
- **Combustion-chamber geometry** is unusual. The flat squish-band is wide, and it results in a small chamber—under half-bore size. To prevent the compression ratio from becoming excessive, the squish clearance has been increased to a large .040 inch (1mm). (In comparison, the ASP 75's measures a more typical .014 inch.)
- **The Mk X carburetor** uses Fox's flange mounting. Several throttle-barrel choke sizes are available; the test engine used the smallest (.330-inch bore) and the largest (.380 inch). The changes in performance that result from using these options are what we expect: the smaller bore is valuable at low rpm where choke air velocity would otherwise be too slow and would impair the correct mixing of fuel to air in the carburetor.
- **Fox needle valves** are unique, and the end of the one on this engine is of the "spade" type. Mechanically, it supports the needle valve within the fuel jet to prevent its point from "wandering" under vibration. I think the usual Fox needle valve is robust enough without this support, particularly where the threaded part is also a close fit (as here). Duke Fox's needle valves probably reflect his early experience with C/L speed planes.

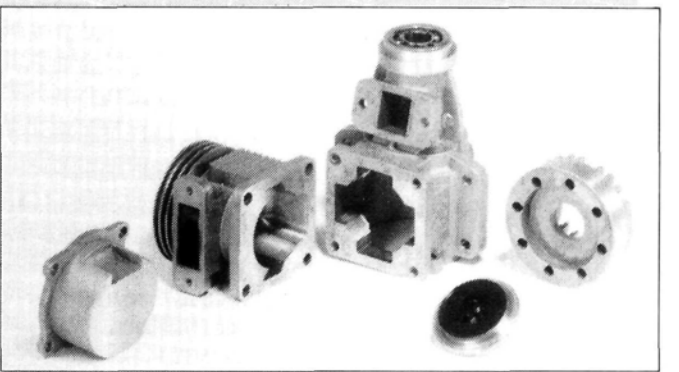
The familiar "twin-needle" style allowed very precise controllable idling speeds and gratifying swift and predictable pick-up through mid-range to full-bore.

I recorded easy idles of 1,675rpm (on the APC 14x8) and 1,900rpm (on the 12x6 APC) using a muffler pressure line to the fuel tank. In operation, the main fuel needle was slightly insensitive, so adjustments weren't overly critical.

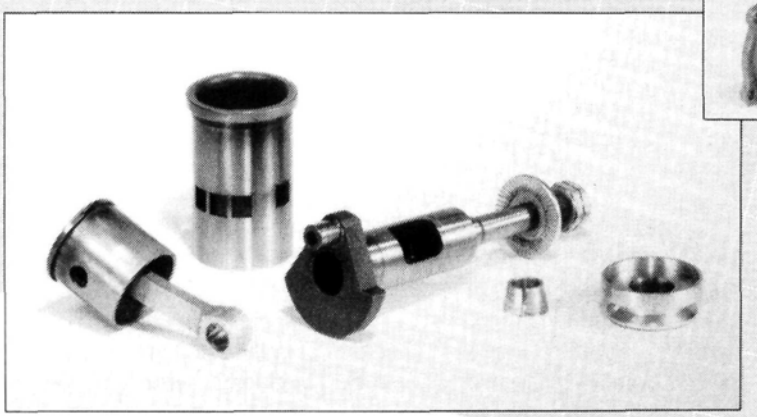
PERFORMANCE

During running-in, I used a range of propellers, and with the muffler fitted, rpm were in the range of 5,000rpm to 15,000rpm. This range should be restricted to a more comfortable 8,000rpm to 13,000rpm.

I used several of the APC propellers, but I can't yet say



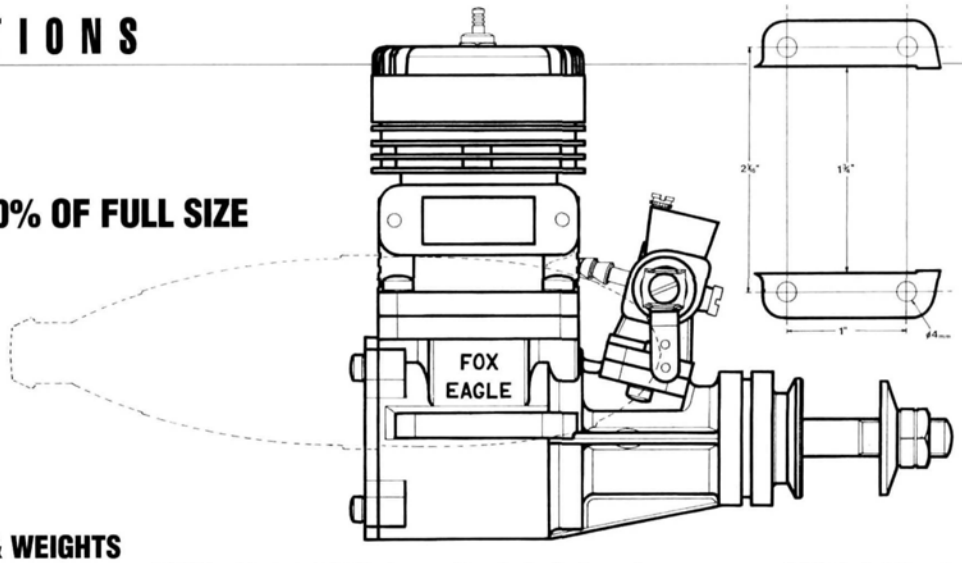
▲ *The symmetrical pattern of the transfer passages in the lower crankcase allows the upper cylinder to be rotated to any of four positions. The blackened combustion chamber shows the manufacturer's preference for castor oil (and large squish clearance).*



◀ *Note the asymmetrical crankweb cutaways that offset the induction slot. The port bars in the hardened-steel liner prevent the piston ring from jumping out and self-destructing. Note also that the propeller washer and the prop driver are knurled to prevent the prop from loosening.*

SPECIFICATIONS

FOX EAGLE 74



DIMENSIONS & WEIGHTS

Capacity ..... 0.7367 cubic inch (12.07cc)
Bore ..... 1 inch (25.4mm)
Stroke ..... 0.938 inch (23.8mm)
Stroke/bore ratio 0.938:1
Timing periods ..... Exhaust - 140°
Transfer - 113°
Boost - 110°
Front Induction:
—Opens - 53° ABDC
—Closes - 50° ATDC
—Total Period - 177°
—Blow-down - 14°
Combustion volume 1.1cc
Compression ratios ..... Geometric - 11.97:1
Effective - 8.92:1
Exhaust-port height ..... 0.261 inch (6.63mm)
Cylinder-head squish ..... 0.040 inch (1mm)
Cylinder-head squish angle ..... 0°
Squish-band width ..... 0.261 inch (6.6mm)
Carburetor bore ..... 0.330 inch and .380 inch (8.4mm and 9.6mm)
Crankshaft diameter ..... 0.669 inch (17mm)
Crankshaft bore ..... 0.475 inch (12.08mm)
Crankpin diameter ..... 0.280 inch (7.13mm) 9/32 inch nominal
Crankshaft nose thread ..... 0.308 inch x 24 TPI (5/16 UNF ANF)
Wristpin diameter ..... 0.250 inch (6.35mm)
Connecting-rod centers ..... 1.69 inches (43mm)
Engine height ..... 4.13 inches (105mm)
Width ..... 2.5 inches (63.6mm)
Length ..... 3.7 inches (94mm)
Width between bearers ..... 1.75 inches (44.5mm)
Mounting-hole dimensions ..... 2.06x1x.15 inches (52.3x25.4x4mm)
Exhaust-manifold bolt spacing ..... 1.375 inches (35mm)
Frontal area ..... 7.1 square inches
Weight (bare) ..... Bare - 18.9 ounces (536 grams) with muffler - 21.8 ounces (620 grams)
Crankshaft weight ..... 3.4 ounces (96 grams)
Piston-rod weight ..... 0.8 ounce (9.22 grams)

whether they lead to quieter running than others. They're certainly the most robust of current designs. The thickness of their blade/hub intersection has been massively increased to withstand the expected stresses of today's more powerful engines (both 2-strokes and 4-strokes). This firmly controlled blade section seems to be efficient, but I think the blade's trailing edge is too sharp, and their color (gray) definitely makes them difficult to see. For safety, it would probably be best to color their tips.

Fox engines come with a comprehensive leaflet that's packed with practical advice. In this one, the section "Fine-Tuning the Carburetor" is particularly helpful—especially to those who seek that perfect "mid-range" throttle transition. The leaflet's down-to-earth summary of the manufacturer's wide experience is much appreciated.

TESTING TIME

Test 1. Open exhaust. Fuel—5 percent nitro/20 percent castor oil/75 percent methanol. Large carburetor plug; Fox long-reach idle bar.

I followed Fox's recommendation to use a generous percentage of castor oil. In open-exhaust format, there was obviously no muffler pressure line for fuel-tank pressurization. This, with the carburetor's larger bore, restricted operations at low rpm, so torque tests started at around 7,500rpm. A peak torque of 165 ounce/inches was reached at 9,073rpm, and a maximum of 2.08hp at 15,000rpm. Noticing ragged running at around 16,600rpm, I decided not to move further up the rpm scale.

Test 2. Standard muffler. Large carburetor. The same Fuel and plug as in Test 1.

With an exhaust outlet of 3/8-inch diameter, the muffler provided enough back-pressure to considerably quiet the 74 and to steady running at low rpm. Speeds down to 4,900rpm were now easy to achieve, though torque was relatively low before 9,800rpm had been reached. Maximum power was achieved at 14,400rpm with a fine 1.81hp, but at higher speeds, the engine began to run unsteadily.

Test 3. Standard muffler. Small carburetor. The same Fuel and plug as in Test 1.

I ran this test with the smaller carburetor just to see how much less power would be (compared with Test 2). At

Performance

Max. b.hp ..... 2.08 @ 15,000rpm (open exhaust/5% nitro/0.380-inch carburetor)
1.81 @ 14,400rpm (muffler/5% nitro/0.380-inch carburetor)
1.66 @ 13,650rpm (muffler/5% nitro/0.330-inch carburetor)

Max. torque ..... 165 oz/ins @ 9,073rpm (open exhaust/5% nitro/0.380-inch carburetor)
154 oz/ins @ 9,600rpm (muffler/5% nitro/0.380-inch carburetor)
141 oz/ins @ 9,480rpm (muffler/5% nitro/0.330-inch carburetor)

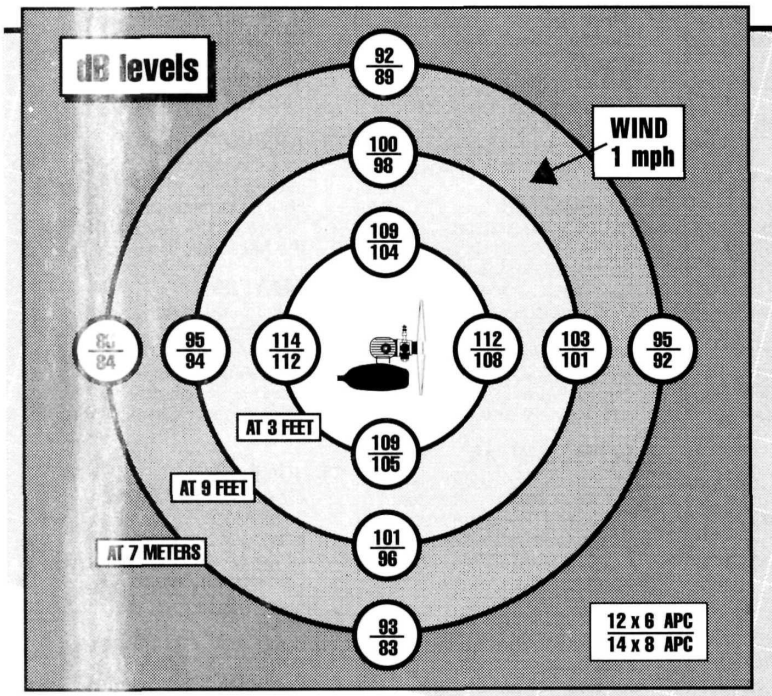
RPM on fixed-wing propellers:

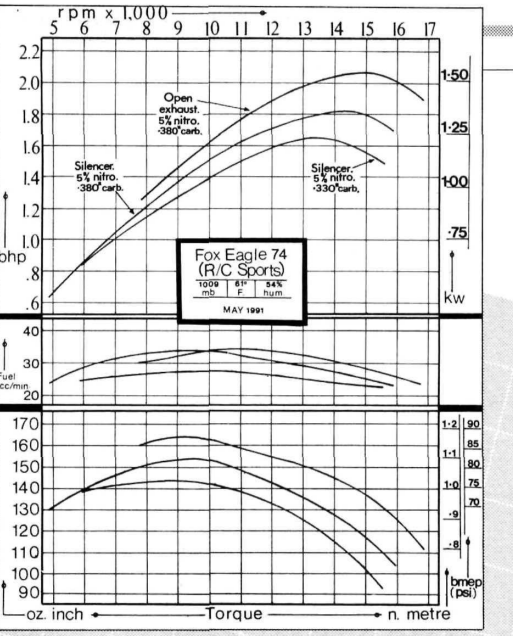
	Open exhaust (carb .378)	Std muffler (carb .378)	Std muffler (carb .332)
8x8 Top Flite	-	5,125	5,190
5x8 Graupner	-	7,777	7,700
6x6 Airflow	8,056	7,740	-
5x8 APC	8,275	8,180	8,030
6x5 Zinger	8,420	8,184	8,078
3x10.5 MK	8,730	8,579	
4x8 APC	9,480	9,400	9,180
3x6 MK	11,597	11,260	11,040
1x10 APC	12,520	12,270	-
2x6 Graupner	13,050	12,736	-
2x6 APC	13,407	13,100	12,814
1x7 APC	14,408	13,825	-
1x5 Top Flite	15,135	14,520	13,960

Performance Equivalents:

hp/cubic inch	2.82	Gram meter/cc	9.7
hp/cc	0.172	b.hp/pound	1.76
ounce inch/cubic inch	224	b.hp/kilo	3.88
ounce inch/cc	13.67	b.hp/square inch frontal area	0.293
ounce inch/pound	139.7		

Manufacturer/Distributor: *Fox Mfg. Co., 5305 Towson Ave., Fort Smith, AR 72901.*





approximately 75 percent choke, power loss at higher rpm was noticeable, but in the area of 8,000rpm, power loss wasn't enough to get excited about. In fact, at the lower rpm, there's a definite reduction in fuel consumption and some improvement in starting and slow-running characteristics.

SUMMARY

Well, it has been quite some time since my last Fox "experience," and I've tested many very sophisticated, amazing engines in the meantime. In terms of appearance, this Fox product is quite a contrast! My strongest impression is that the impulse to "prettify" has been strongly resisted, and that Fox has attempted to "do it differently." Though among the most innovative of USA-made model engines, the Eagle 74's design reveals a considerable respect for tradition and methods that have been validated by the test of time. If run properly, it promises to be extremely durable.

For many users, Fox's straight, unpretentious engineering is enough in itself, and the engine's performance won't mar the pleasing impression given by "Duke's" Eagle 74. ■

SOUND LEVELS—dB

Engine: Fox Eagle 74 2-stroke (12.07cc)
Equipment: Standard muffler/.330-inch carburetor
Fuel: 5 percent nitro/20 percent castor/75 percent methanol
Temperature: 61° Fahrenheit
Humidity: 54 percent
Propellers: APC 12x6; APC 14x8
Mean rpm: 12,500; 9,000
Engine position: 3 feet above the ground
Sound meter: Radio Shack's 33-2050 unit set 38 inches above the ground and pointing toward nearest sound, i.e., propeller or muffler.
Meter settings: "A" scale and "slow" response.
Distance from engine: 3 feet, 9 feet and approximately 21 feet.

GIANT STEPS

(Continued from page 79)

joints should mate well (no gaps) and your glue joints should be made carefully.

I save all the scrap 1/64- and 1/32-inch plywood that crosses my building board. I use it to make the gussets I use in all my building, and it comes in handy for backing up scarf joints and other joints. This thin plywood can be cut easily with the usual modeling knife and may also be cut with scissors or with an office paper cutter. (I found a small office paper cutter some years ago in a secondhand shop and bought it. They may seem a little on the expensive side, but they're worth having if you do much scratch-building and use thin plywood for gussets.)

UNLIMITED R/C RACING

Volume 2, Number 2 of "Unlimited Racing News" arrived recently, and plans are moving ahead nicely for the racing on October 3 to 6, 1991. As I mentioned earlier, the site will be the Madera Municipal Airport in Madera, CA. Madera is on Highway 99 about 20 miles north of Fresno, so it's a convenient location. According to reports, the people at Madera

GIANT STEPS

are enthusiastic about R/C Unlimited Racing and are doing all they can to ensure the success of the event. Currently, race organizers have approximately 99 confirmed entries, and a considerable number are P-51s. There are several P- 38s, a couple of F7F Tigercats, an F8F Bearcat or two, a couple of Sea Furys, an A-26 and a Tsunami or two, along with a few so-far-unidentified racers. It certainly looks like Reno in miniature.

If you plan to watch, write to or call R/C Unlimited Racing, 565 Mercury Ln., Brea, CA 92621; (714) 622-1814. They'll provide you with information on accommodations and reservations. ■

SPORTY SCALE

(Continued from page 56)

stab. This helps you to make nicer subassemblies, and the nicer your subs are, the nicer the completed model will be! When it's time to sheet your framework, try to use contest-grade or light wood on all the tail surfaces, and on as much of the fuselage back past the front of the wing

(Continued on page 98)

Expanding the flight envelope

Design for Flaps Part One

The first in a series leading to a construction article • by ANDY LENNON

AN R/C MODEL designed specifically for flaps opens up a new and exciting dimension in sport flying. This airplane will be fast, structurally rugged and well-streamlined, and it will have a higher-than-usual wing loading; but with flaps lowered, it will land at trainer speeds of around 20mph. It will also have a very wide speed range!

The first part of this article deals with the design of a model that will use flaps; the second part will detail the design and actuation of the flaps themselves and give tips on flying with them.

To illustrate the features of a model designed for flaps, consider the Snowy Owl (photos 1 and 2). This plane was built seven years ago and is still flying. Powered by an old O.S. Max .40 FSR engine, it weighs 104 ounces, has a wing area of just under 4 1/2 square feet, a wing loading of slightly less than 24 ounces per square foot, and a power loading of 260 ounces per cubic inch of engine displacement. It features the NASA "safe wing" droop modification (see *Model Airplane News*, June 1990).

This model's performance has proven to be better than any other .40-powered model encountered so far. Takeoffs—flaps half extended—from grass require no more than 10 feet with a fast steep climb. Landing approaches—flaps fully extended and engine idling—may be very steep (almost vertical) without significant acceleration. This results from the high flap drag when when the flaps are fully extended.

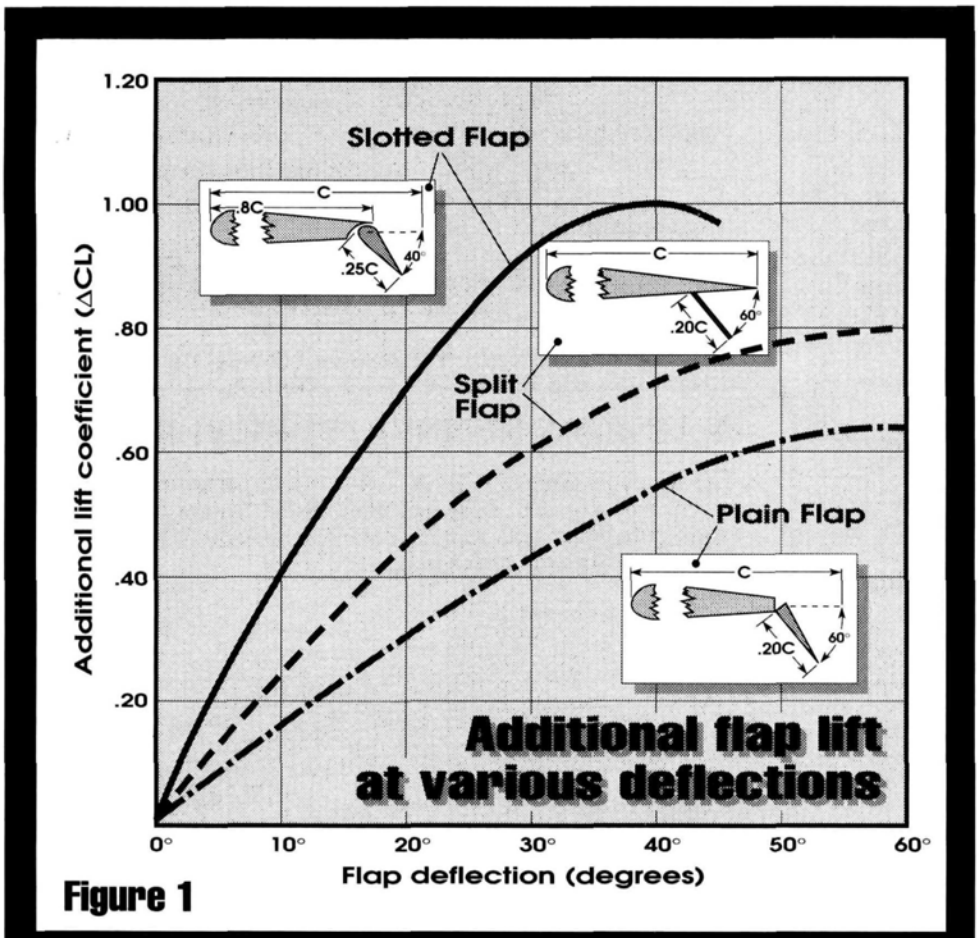


Figure 1

Flap types

The three basic types of flaps that may be used for models are:
—plain
—split
—slotted

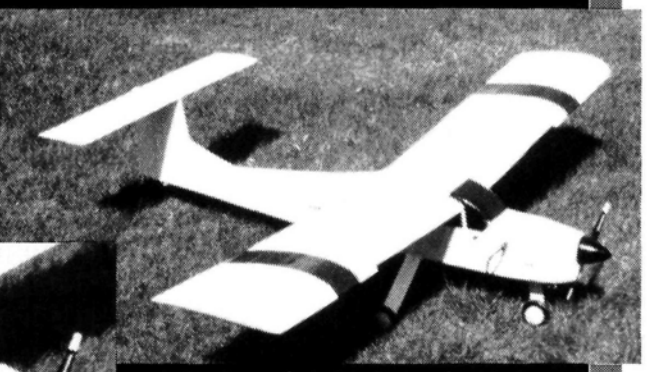
• The plain flap. When extended, the plain flap adds the least lift of the three and has high drag. Structurally, it's similar to an aileron.

• The split flap provides higher lift than the plain flap, but it has high drag, which prohibits its use for takeoffs.

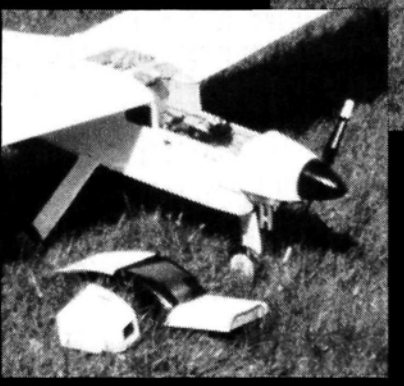
• The slotted flap offers the highest additional lift and has the lowest drag, so it can be used, half extended, for shorter, slower takeoffs. It provides its maximum lift when deflected to 40 degrees.

The second part of this article will focus on the slotted flap. Its design, construction and operation are not complex.

Snowy Owl's key design features



1. The Snowy Owl. Note its low-drag design and NASA safe-wing droop.



2. The easy-to-remove canopy and lower cowling allow access to the fuselage and the engine.

Which factors contribute most to Snowy Owl's good performance?

- **Most important is the careful attention to drag reduction. A 2½-inch Goldberg* spinner fairs into a ducted cowling that fully encloses (and quiets) the engine and J'Tec* muffler. The wing airfoil—Eppler 195—was developed specifically for the low Reynolds numbers of model flight, and it has very low-profile drag. The tricycle landing-gear legs are streamlined with rugged balsa-and-ply fairings. The wheels are Williams Brothers* 2½-inch-diameter, smooth-contour type. (Bare wire landing-gear legs and big, fat tires have an astonishing amount of drag.) The horizontal and vertical tail surfaces have low-drag, symmetrical airfoil sections. Though "slab-sided," the fuselage has generously rounded corners—no exposed dowels and rubber bands to hold the wing.**

The rugged, fully balsa-sheet-covered flying surfaces have no lift-reducing, between-the-ribs, sags in the covering. The antenna is enclosed in the fuselage and fin, and the MonoKote* covering provides a smooth, slippery surface. All control horns are internal, or only slightly exposed.

- **Second in importance are the rugged slotted flaps whose area is 13.6 percent of the total wing area, and which occupy 60 percent of the wing's trailing edge. They may be extended at any air speed.**
- **Third in importance is propeller selection. The make, diameter and pitch that provide the best performance can only be chosen after repeated trials. During trials of many props, the Master Airscrew 10x7.5 proved best for the Snowy Owl, and it's very durable.**
- **The NASA safe-wing modifications.**
- **Despite its higher gross weight (at least 15 ounces more than most .40-powered sport models), the greater wing loading results in a smaller model overall with a wing area of 4.5 square feet. (Most sport models run 5 to 6 square feet.)**
- **The high gross weight permits a rugged structure; flaps and their servos and linkage add 3 to 4 ounces; but the balance of the additional weight provides strong, stiff, fully balsa-sheeted surfaces (based on stressed-skin principles) that are absolutely warp-free.**

3. The Seagull III—an amphibious flying boat. Powered by an O.S. Max 46SF engine, it weighs 113 ounces and is an excellent performer. Its large slotted flaps are fully extended for landing.

Stalls—flaps down—are at 17mph. On a low-wind day, full-stall slow landings are pure fun—like a bird landing on a branch—and ground roll seldom exceeds 4 feet.

With a 10x7.5 Master Airscrew* prop, the Snowy Owl's top speed is estimated at 75mph. It's fully aerobatic, but it refuses to do more than one or two turns of a spin, which is then converted into a fast spiral dive (courtesy of the NASA droop) and from which recovery is prompt upon neutralizing the controls.

On a windy day, it will hover, almost motionless, flaps fully extended, engine throttled back and with full up-elevator. Aileron control is still effective in this nose-high attitude, and no tip stalls occur.

It's great fun to make a low pass—flaps fully extended; engine throttled; nose-high attitude—at about 25mph, followed by another pass with flaps up and engine wide open.

The Snowy Owl's speed

Design for Flaps

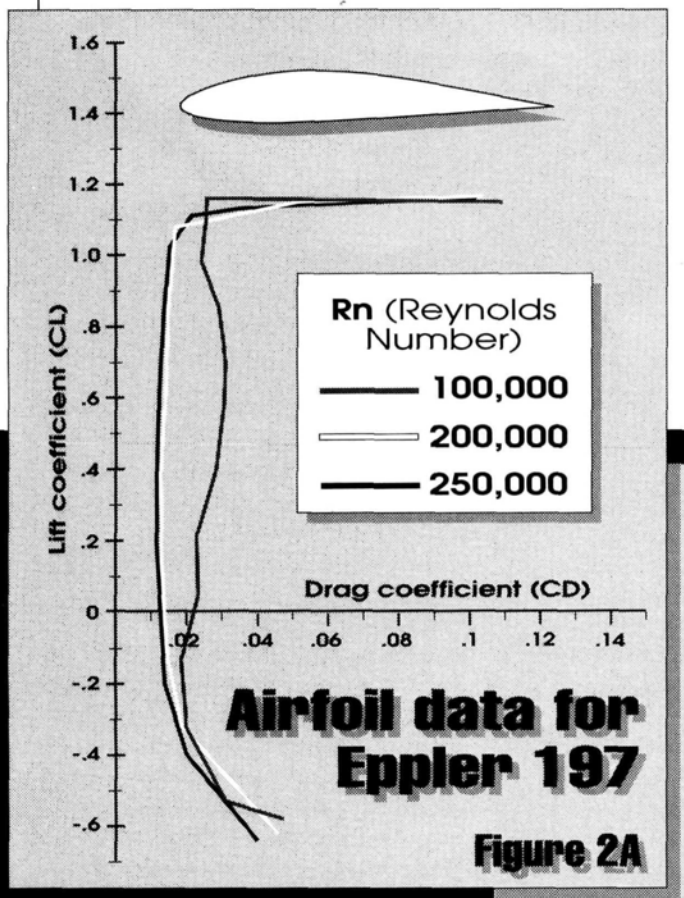


Figure 2A

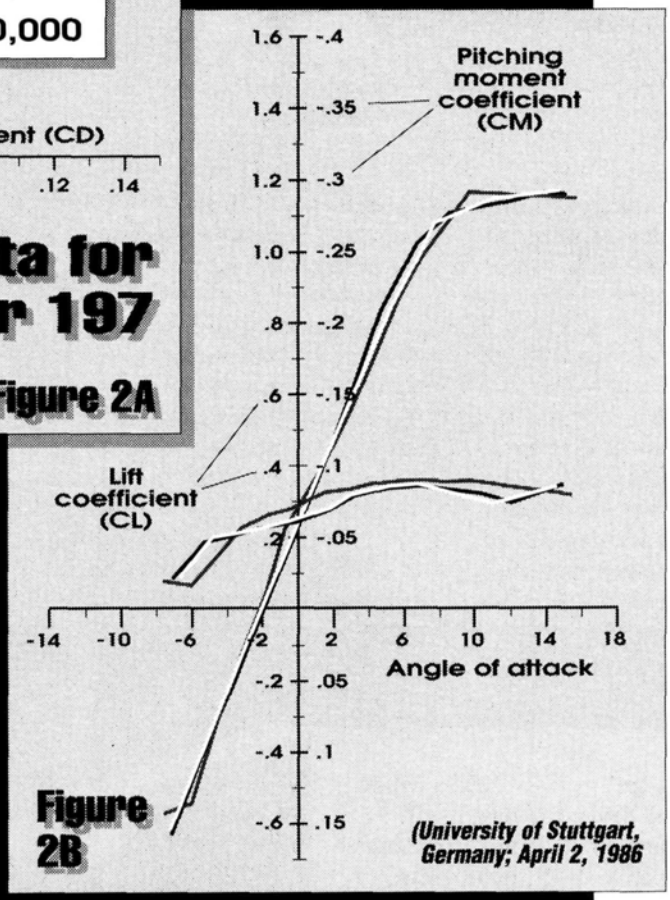


Figure 2B

Finding CL max

The wing area overlaying the fuselage is considered to provide the same lift as the wing's airfoil. Flaps comprise 15.4 percent of the wing area.

The airfoil chosen for this wing is the Eppler 197—13.4 percent of chord in thickness—which provides for deep, strong spars. Figures 2A and 2B give performance curves for this airfoil, which was tested in a wind tunnel at the University of Stuttgart, Germany.

Note the model airplane Reynolds numbers (Rn); the good maximum lift of 1.2; the gentle stall; the moderate pitching moment; and on the left, the wide, low-profile drag bucket at Rn 250,000—for our wing, roughly 35mph.

Referring to Figure 1 (see sidebar on flap types), the additional lift coefficient (CL) provided by a slotted flap that's deflected to 40 degrees is CL 1.00. The NASA droop increases this by CL 0.4. For those who are design-minded, the average CL max of this wing would be 1.933. This can easily be calculated by adding the maximum lift coefficient indicated in Figure 2 to the additional lift coefficients provided by flaps, droop and fuselage.

Flapped area:	346.2 sq. ins. at CL max of 2.2 =	761.64
Drooped area:	190.8 sq. ins. at CL max of 1.6 =	305.28
Fuselage area:	39.0 sq. ins. at CL max of 1.2 =	46.80
Totals:	576.0 sq. ins.	1113.72

Average CL max: 1113.72 ÷ 576 = 1.933

range is remarkable. Maneuvers—flaps down—are very tight indeed. On a day with little or no wind, don't attempt to land the Snowy Owl flaps-up, because the glide is fast and very flat, and you could easily overshoot the flying field.

On the other hand, landings on a very windy day should be made flaps-up. The high wing loading provides good penetration, and the high *air speed* gives good control. Thanks to the NASA droop, there are no wing-tip stalls when making nose-high landings.

SLOTTED FLAP DESIGN

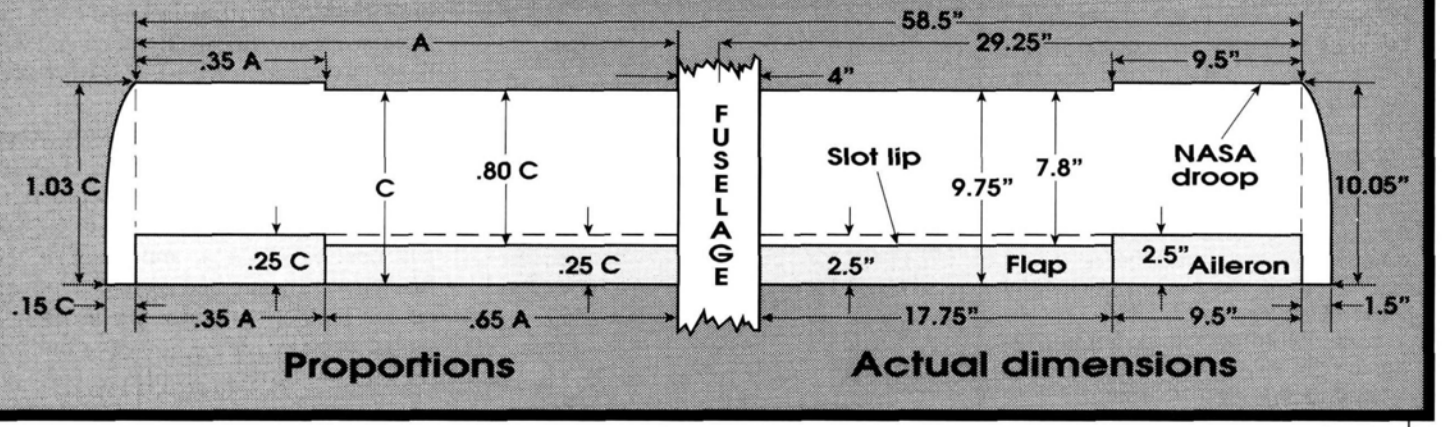
Let's make a bold stab at designing a wing for a slotted-flap-equipped model called the "Swift." This will ultimately lead to a construction article that will be published in *Model Airplane News*. To a greater extent than the Snowy Owl, this design will take advantage of the lift-increasing capacity of the extended flaps.

For this project, the chosen wing loading is 25 ounces per square foot of wing area. This is higher than Snowy Owl's and should result in a smaller, lighter model with even lower drag. By comparison, a gross weight (with fuel) of 100 ounces seems reasonable. The wing area would thus be 100 divided by 25 to equal 4 square feet, or 576 square inches. The Swift is powered by an O.S. Max .46 SF engine, and its power loading is 217.3 ounces/cubic inch displacement.

For this project, test-fly with Master Airscrew or APC* 10x9 and 10x10 props to select the one that performs best for this model. At 11,000rpm, a 10x9 prop would produce an estimated top speed of 90mph.

Figure 3 shows the actual dimensions of the

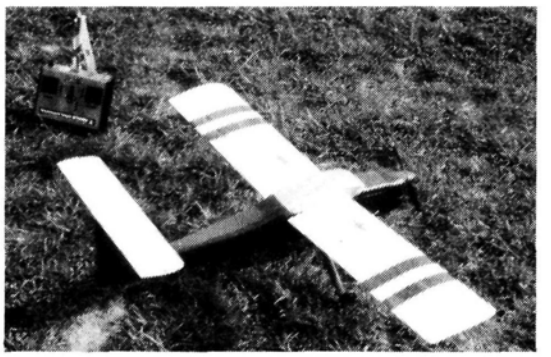
Figure 3: Outline of the Swift's wing *(576 square inches; aspect ratio of 5.94)*



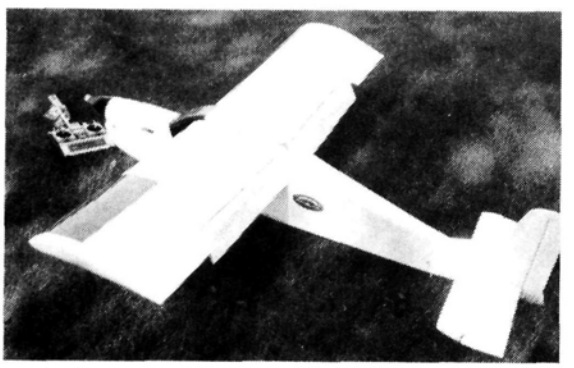
Swift's wing and the proportions of its features. With a wing loading of 25 ounces per square foot and a CL maximum of 1.933, this model will stall at just under 18mph at sea level. If you have the coefficient of lift for a particular airfoil and wing loading, stall speed can be estimated quickly by using the curves shown in Figure 4. Add 20 percent to this stall speed for a safety margin, and this model would be capable of touching down, nose-high at 22mph under "no-wind" conditions. This is a comfortable landing speed.

In Part 2, the procedure recommended for building model airplane flaps will be shown. See you then!

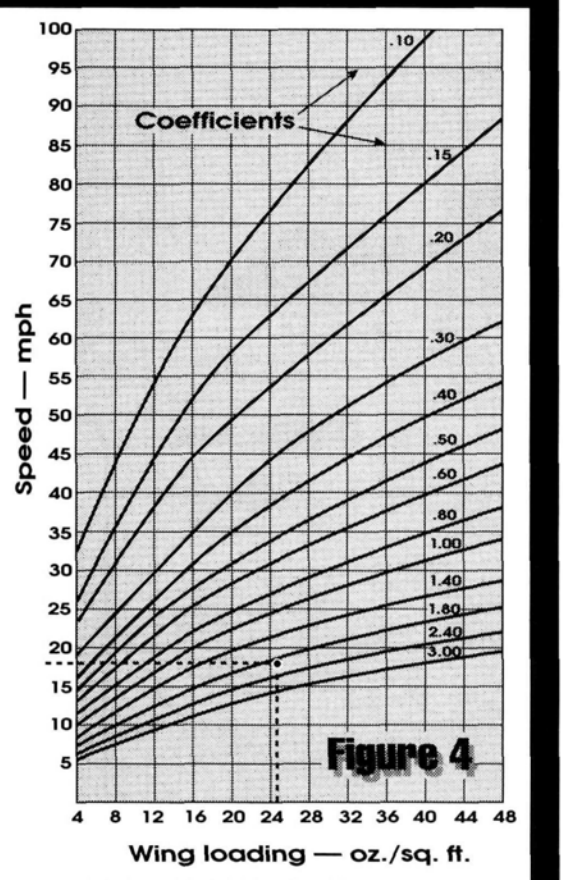
Editor's note: for more information on airplane design, we recommend Andy Lennon's ***"R/C Model Airplane Design,"*** *which is available from Motorbooks International, P.O. Box 2, 792 Prospect Ave., Osceola, WI 54020; telephone: (715) 294-3345.*



4. Sparrowhawk is a 15-powered airplane with a wing area of 250 square inches and a wing loading of 22 ounces per square foot. It's nimble and fun to fly (Model Aviation, January 1987).



5. The Osprey is a tail-dragger. Powered by an O.S. Max 45 FSR, it weighs 113 ounces and has a wing loading of 26.5 ounces per square foot. Under "no-wind" conditions, it takes off from water in less than 40 feet.



Curves for quick estimation of speed

(Here used to calculate stall speed for the *"Swift"*.)

From wing loading at the bottom, read vertically to the applicable lift coefficient and then move left (horizontally) to find the speed in miles per hour. The stall speed is based on an airfoil's maximum lift coefficient (see example in text).

Here are the addresses of the companies mentioned in this article:* ***Master Airscrew;* *distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.* ***APC Landing Products,*** *P.O. Box 938, Knights Landing, CA 95645.* ***Carl Goldberg Models,*** *4734 West Chicago Ave., Chicago, IL 60651.* ***J'Tec,*** *164 School St., Daly City, CA 94014.* ***Williams Bros.,*** *181 Pawnee St., San Marcos, CA 92069.* ***MonoKote/Great Planes Model Distributors,*** *1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61824.* ■

SPORTY SCALE

(Continued from page 93)

saddle as possible. Medium-weight wood can be used on the wing. Since you'll probably want to fiberglass-and-resin the framework anyway, the lighter wood will be just as strong as the heavier stuff after the resin has cured.

You may want to note that we've been using two grades of fiberglass cloth on our 20-pound-plus scale models lately: Dan Parsons' 6/10-ounce cloth on all tail and control surfaces, and most of the fuselage and wing; and 2-ounce cloth on certain high-stress areas. We're finding that, especially for the novice or bull-in-the-china-shop type, the heavier cloth reinforces high-stress areas such as wing saddles, engine bays and landing-gear locations. The chances of splitting the upper wing skin after dropping your new pride and joy in from, say, 4 feet, is drastically reduced by using the 2-ounce stuff. Don't worry, your favorite hobby shop can provide you with the industrial grade!

TOP GUN TIDBITS

Top Gun invitations have surely gone out by the time you read this. A few more will

(Continued on page 102)

FLOATING AROUND

by JOHN SULLIVAN

America on-step

THE ADVENT of our special "Floatplane Issue" always finds me reflecting on the growth of float flying during the previous year. No fewer than nine manufacturers have introduced float products since last October, and there are now 27 firms producing floats, floatplanes and related items! Float flys have become standard during the summer months, and they draw huge crowds. Last year alone there were major meets at Clearlake, Brimfield, Holy Oak, Lake Elsinore, Plat One, Higginsville, Woodland and Portland; there was also the Oshkosh QSAA Meet, the Havasu Fun Fly, and most important, the Schneider Race Re-Creation, which became a premier scale modeling event overnight!

There are literally thousands of float modelers across the country, many of them organized into sanctioned clubs whose members fly on floats exclusively. Add to this that float flying opens up thousands of potential new flying sites, reduces crowding at existing land sites and provides an outstanding new dimension to R/C modeling, and you begin to wonder...why hasn't the AMA noticed this? Last year, the French and British modeling press sent three editors to the Schneider Race. All three went home and published six-page color spreads on the event, but not a word appeared in "Model Aviation"!

Clubs were evident at Clearlake '91. Pictured here (but not necessarily in this order) are Joe McLain, Will Schneider, Dennis Petigro, Gary Cervo and John Gain, who hail from the Santa Clara County Skyport Club.

To be fair, the AMA did publish an article by Frank Kelly on the Swiss Coppa Schneider in June '91. Float flying is expanding in the USA, and the sport should be recognized officially by the AMA. C'mon Messrs. Lowe, Brown, Mankowski and McMullen, the waves of change are lapping at your feet! How about actually listing float flying on your next survey instead of leaving it to "other activities"? I bet you'll be amazed at how many modelers are involved.

Dennis Petigro displays his neat Goldberg Sky Tiger twin conversion; it uses World Engines Brat 25s for power.

THE MORE, THE MERRIER

A lot of reader reports come from guys who belong to float clubs or associated groups. While at Clearlake, I had a chance to focus on such a group. The five guys belong to the 18-member Santa Clara County no. 110 Skyport Club. One of them, John Gain, caused quite a stir in this magazine a couple of years ago when we published a picture of his twin sport amphibian. About 50 readers wrote for more information, but I had lost John's address! This year, John showed up with a black O.S.* 40-powered Great Planes* Sportster on gray Gee Bee* floats—a sharp combination with sparkling performance.

The Santa Clara group also brought two Hobby Kingdom Cherokee 40s on Gee Bee floats, a Goldberg* Cub on Goldberg floats, and a .50-powered Sarpolus 4-Runner on D&J floats. But the model that really caught my attention was the Goldberg Sky Tiger that Dennis Pettigru of San Jose, CA, had converted into a twin! Writing from my notes, I think Dennis increased the Tiger's span and beefed-up its center section before adding the twin World Engines Brat .25s in custom nacelles. The Tiger's nose panels are pointed with scarfed lite-ply extensions, and the canopy area is roofed to produce a very slick Beechcraft look. The final touch is that elegant vee-tail with ruddervators. As I remember, the airframe was covered with

(Continued on page 101)

Esio Grassi mounted his 16-year-old "Miss America" on 44-inch Sullivan floats, and he's delighted with the results! Skimming inches over the water and shooting touch-and-go's are a delight with this great performer.

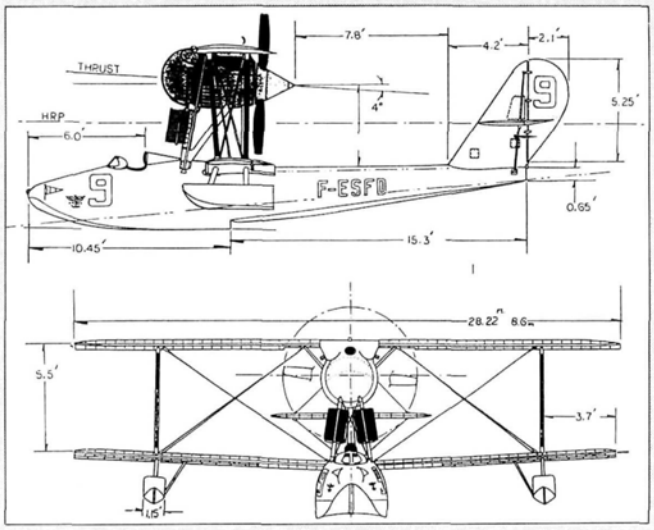
PHOTOS BY JOHN SULLIVAN

THE SCHNEIDER CORNER

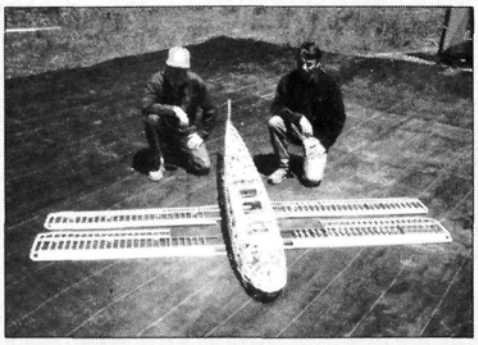
Our next installment of the Schneider Corner will come out during the race, so it's time to hit those high points for the last time! If you're planning to enter, contact event Chairman Bob Martin or Contest Director Bob Lake immediately! You'll need the '91 entry form and the race rules. I also recommend that you subscribe to the "Schneider Cup News." For the $5 subscription, you'll get invaluable source material that can save you dozens of hours and phone calls!

For those who plan to go to Havasu as spectators, I've listed the numbers of a few hotels and the Lake Havasu Chamber of Commerce. The dates are November 1, 2 and 3, and here's a brief "tour": the Schneider Cup race is held at the Nautical Inn. This isn't a charming little place with a guy with a wooden leg behind the bar. The Inn is a city unto itself with restaurants, bars, rooms, RV sites, shops, spas, tennis courts and an 18-hole golf course! We race on the Inn's waterfront, which stretches for a half mile, and we have the clear waters of Lake Havasu for a landing strip. It's easy to go on: there's the London Bridge, incredible desert vistas, more great lodging and everything you'd expect to find at a major tourist destination; but the bottom line is that I can't think of a better meet held at a better site, and the prices are reasonable!

Our Schneider study for this month is the CAMS 38, which raced at Cowes, Isle of Wight, England, UK, in 1923. The CAMS was a French entry flown by "Lt. de Vaisseau" Maurice Hurel. The plane had a wingspan of 28 feet, a length of 27 feet, and was powered by a 360hp Hispano-Suiza V8 swinging a pusher prop. The CAMS (Chantiers Aero-Maritimes de la Seine) marks the end of an era in Schneider racing, as it was the last biplane in the flying-boat configuration to enter the competition. Hurel hit 131mph (not bad for a 1923 V8!), but had to retire when his propeller hub worked loose and the engine crankshaft seized!



Front and side views of the CAMS 38, courtesy of Bob Hirsch, aviation historian. The CAMS, which flew in 1923, was the last flying-boat biplane to enter the Schneider Cup.



Richard Lucas (left) of Fort Bragg, CA, is shown with his CAMS 38 in the framing stage. Richard and his pilot Lan Mace will enter the French bipe in the '91 Schneider Race at Lake Havasu, AZ.

That's the bad news. The good news is that the CAMS 38 is being built in 29-percent scale by Richard Lucas of Fort Bragg, CA, and it will fly again at the '91 race re-enactment! There are more than 100 truss ribs in this biplane, and they were all built in jigs using 1/8-inch balsa! The fuselage appears to be a combination of formers and stringers built over a central box girder that zigzags through two-thirds of the fuselage to stiffen hard point areas. The hull and fin will be sheeted, and the rest will be fabric-covered.

The CAMS will have a 97-inch wingspan and will come in at around 35 pounds. Power will be provided by an A&M* 4.2 Sachs swinging a 24x10 pusher prop, and the radio selected is a Futaba* 8-channel PCM. The target speed for this huge biplane is 42mph. Lan Mace and Richard Lucas developed the plans from Robert Hirsch three-views and photographs from various sources. Richard has taken on the building chores, and Lan will be the official pilot for the race.

Last year's re-enactment had 31 entrants. With reports of two new Bernards, a 9-cylinder Short-Bristow Crusader at Clearlake, a 1/2-scale Sopwith, the Lucas CAMS 38 and other projects under way, this year's race could easily see over 50 entrants! Fifty superb, giant-scale seaplanes spanning two decades of the hottest development in aviation, presented in a desert oasis setting sounds like a model aviation dream come true... and it is! Don't miss it; I'll see you there!

If you're planning to attend the Schneider Cup Re-Enactment, you'll need these phone numbers: Bob Martin/Schneider Cup News (602) 855-6900; Bob Lake (602) 855-0471; Nautical Inn Resort (800) 892-2141; Ramada London Bridge Resort (800) 624-7939; Lake Havasu Pioneer Hotel (800) 528-5169; Lake Havasu Chamber of Commerce (800) 242-8278.

FLOATING AROUND

(Continued from page 99)

cream MonoKote* and the 36-inch Sullivan* floats were painted to match. This Sky Tiger twin conversion is a satisfying performer, and I think the vee-tail has a lot to do with it. If you'd like more information on Dennis's modifications, write to him c/o "Floating Around," and we'll see that he gets your notes. I'd also like to hear more about what you're doing and where, so send your photos to me at "Floating Around."

Ed Westwood spotted this Turbo Beaver in a Washington hangar. Its high-aspect-ratio wings generate gobs of lift, carry loads well, display very low stall speeds and go fast, too!

THE FLOATING MAILBAG

Esio Grassi, of South Weymouth, MA, sent along a picture of his 16-year-old "Miss America" on 44-inch floats. After eight sessions with the old-timer, he wrote to *Model Airplane News* to tell us that he loves it! Esio says that liftoffs are so majestic and realistic that he usually spends entire flights shooting touch-and-gos, and taking off and landing. I know from whence Esio comes. These old-time planes exhibit the adroitness and command we wish every model had.

The plane's weight went from 7 to 10 pounds when the floats were added, and the H.P. 40. swinging an 11x4 Rev-Up* prop is adequate for either land or sea operation. The foam floats are lightly epoxy/glassed with 2-ounce cloth on their bottoms and 3/4-ounce cloth on their tops—plenty for this application—and painted with Formula U*. Esio added spray deflectors to the floats from the prop arc forward and skeg strips on the step flat. He reports that the drop rudder has plenty of authority and works well in winds up to 12mph.

Esio didn't give me the name of the lake he flies from, but it must be close to South Weymouth, and it looks as if there's room for one or two more floatplanes! Float fliers easily learn to fly off difficult water conditions, but calm days like the one shown really get the blood pumping. Thanks Esio!

Looking about as real as they get, this 12-foot-span, 1/4-scale Beaver is nearing production at Unionville Hobbies in Canada. A set of 67 1/2-inch floats is slated for installation.

THE BEAVER CORNER

Ed Westwood sent along a shot of a deHavilland Turbo Beaver he spotted in a hangar near his home in Spanaway, WA. I've only watched the Turbo Beavers perform on videos, but I can tell you these magnificent floatplanes are really

(Continued on page 106)

SPORTY SCALE

(Continued from page 98)

go out immediately after the Scale Masters, which takes place during the last week of October in Las Vegas, NV. Don't forget, if you're familiar with someone who you think deserves an invitation to Top Gun, let me know and I'll present their name before the review committee. Also, if any of you feel you're ready for a slot in Top Gun's Team Scale division, simply mail me a brief letter about yourself and your pilot, the pilot's contest experience, and a description and picture of your aircraft. Please don't forget that Top Gun '92 will have six entrants in the Manufacturers Unlimited Division. These will be aircraft constructed under a no-holds-barred builder of the model rule. Manufacturers must sponsor a team of two to four members, and provide them with team colors (shirts, jackets, hats?) and aircraft. These six teams will fly with everyone else, but their scores will be posted only against one another. There will be a substantial award for *first place* and nothing for anything below it! That's right, the winner of Unlimited gets all the glory, all the prestige and all the gold. Should be real interesting, whaddaya think?

Well, think it over, and drop any comments to me in care of *Model Airplane News*, or to my address at the end of the column. Until next time, don't forget to bring in that smelly fuel can from behind the front seat of the family car, remember that a mixture of methanol and nitro is a real pain in the "phastarus" to get out of that new carpeting, and please, clean those fingernails after a full day of flying fun before you reach in to sample tonight's dinner surprise. And don't forget to check that you know what!

** Here are the addresses that are pertinent to this article:*
Lone Star Models, 1623 57th St., Lubbock, TX 79412.
Sig Mfg., 401 S. Front St., Montezuma, IA 50171.
Midwest Products, 400 S. Indiana St., Hobart, IN 46342.
Mighty Lite; distributed by House of Balsa, 20130 State Rd., Cerritos, CA 90701.
Dan Parsons Products, 11809 Fulmer N.E., Albuquerque, NM 87111.
Frank Tiano, 15300 Estancia La., W. Palm Beach, FL 33414.
Nick Ziroli Models, 29 Edgar Dr., Smithtown, NY 11787.
Don Smith Plans, 2260 N. Dixie Hwy., Boca Raton, FL 33431.
Jerry Bates Plans, 102 Glenwood St., Mobile, AL 36606. ■

TIGER MOTH

(Continued from page 62)

shabby! Ray is a careful builder, and not necessarily fast. Part of the credit for this quick build must go to Unionville Hobbies for a very quick and simple, yet adequate design.

With its tank empty, the Tiger Moth weighed in at 6 pounds for a wing loading of 18.8 ounces per square foot—a very respectable number for a bipe on floats.

TIGER MOTH TRAVEL

At this point we have a "real" economy-

(Continued on page 104)

TIGER MOTH

(Continued from page 103)

sized deHavilland Tiger Moth (Canadian version) that can travel around in one piece in the back of a Datsun. There were 5mph winds and sunny skies for the first week of testing. Ray is one of those guys who loves to shake like an unbalanced wash machine on the spin cycle, so he elected to take first flight. Hindsight is great, and he needn't have worried at all. Owing to its frontal area, the Tiger Moth requires a small amount of rudder work to get it past the "hump" phase. This is not unusual for a floatplane, and the effort is probably a tenth of what you'd experience with a tail dragger on land. Once over the hump, and riding level again, the deHavilland tracks unerringly. Takeoffs are easily manageable at half-throttle with the Fox .40.

Ray says the flight characteristics of the Tiger Moth are almost identical to a .25 Goldberg Eaglet he has flown for more than two years. The Moth can be flown rudder-only or aileron-only, in average conditions. Loops can be very tight or large. Axial rolls with the Tiger Moth just don't happen, but barrel rolls with a little rudder are pure poetry, and wingovers are smooth and steady.

The Tiger Moth's second outing proved to be the real test. Our California skies were clear again, but this time, we had an erratic, buffeting 25mph wind snaking through the valley, with gusts of over 30mph. Ray took the first flight. Upwind progress was agonizing, turns required rudder input to prevent the plane from being swept away; and the Tiger Moth fairly scooted downwind until it was time to expose all that wing area to

another turn. After about five minutes of this, Ray announced that he "wasn't having any fun" and he plopped the Tiger Moth on the water about 75 yards downwind from our beaching area. Straight ahead in a displacement taxi mode was possible at one-third throttle, but turns were completely out of the question, so Ray had to crab a little, and then forge ahead a little, all the way back.

It was a rough time! The amazing thing is that four others tried the skies that morning (all single-wing ships) and no one fared better than Ray's Tiger Moth!

With the exception of the Ace 4-40, I haven't seen a biplane in this size range that equals the Tiger Moth's performance. What's more, you get a genuine piece of aviation history in the bargain! This is a sport-scale project that just might encourage you to delve deeper into all that scale flying has to offer—and that's a lot!

**Here are the addresses of the companies that are mentioned in this article:*
Unionville Hobby Supply, *P.O. Box 135, Markham, Ontario, L3P 3J5 Canada.*

(Continued on page 106)

TIGER MOTH

(Continued from page 105)

***Fox Mfg.,** 5305 Towson Ave., Fort Smith, AR 72901.*
***Futaba Corp. of America,** 4 Studebaker, Irvine, CA 92718.*
***MonoKote;** distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.*
***John Sullivan Model Products,** 1421 2nd St., Calistoga, CA 94515.* ■

FLOATING AROUND

(Continued from page 101)

hot rods with seating for eight, room for a ton of baggage, and the most powerful transition from displacement to takeoff I've ever seen! Ed's new ship, the "2 Ugly," is featured as a construction article in this issue, so take a look. Ed and Paul Weston are also working up plans to convert their Beast to wheels—that could get interesting!

Keep your bilges blown and your anchor within reach, and we'll be back in November!

**Here are the addresses of the companies mentioned in this article:*
***O.S.;** distributed by Great Planes Model Distributors*
***Great Planes Model Distributors,** 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61824.*

(Continued on page 134)

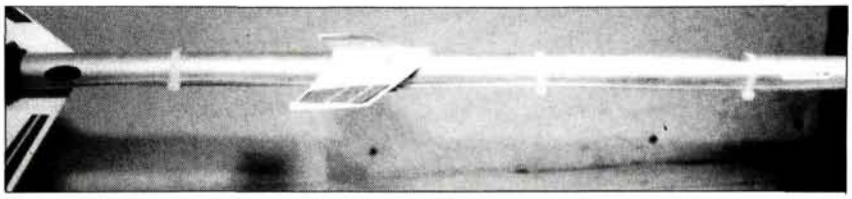
HELICOPTER SECTION

PHOTO: The machine shown above was named the "Kopter-Kart" by its inventor Igor Benson because it used six McCulloch MC75 engines (a very popular go-kart powerplant), instead of the typical single engine. The engines are postioned in two rows of three.

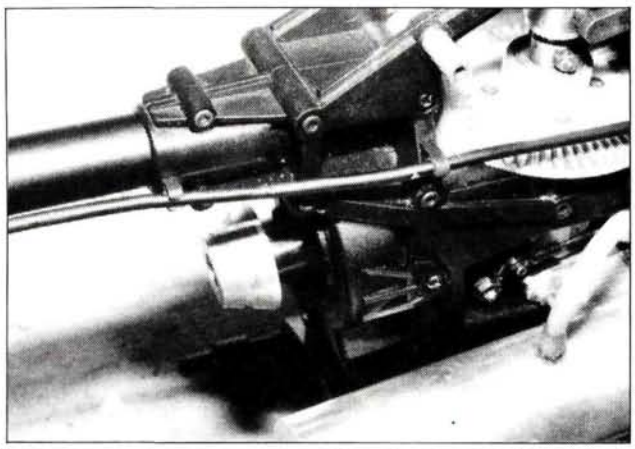
In this issue, Craig Hath continues his series on areobatics with instruction on how to dance the "pirouette" with your machine. A. E. Stanley shows us how to eliminate play in the Concept 30 tail-rotor linkage with a clean, effective modification. Two new helis are highlighted in the "Rotary-Wing Roundup" section, so check them out!

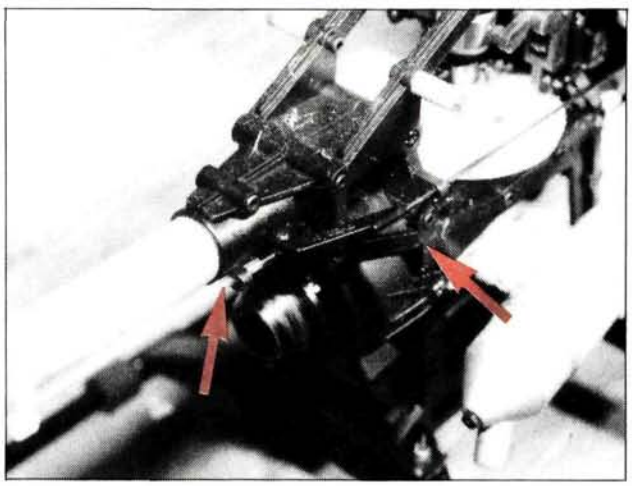
Cable Tail Control

by A.E. STANLEY



The stock rudder-control assembly. Note the tie-wraps holding the wire in place.





■ *Bottom: In the stock system, the area between the two arrows is where most of the flexing (i.e., slop) occurs.*

■ *Top: This is the same area after the conversion.*

A new concept for the Concept

IF YOU'RE an avid helicopter pilot, you've no doubt read a lot about the Kyosho* Concept. Among new heli fliers, the Concept is quickly becoming one of the most popular machines on the market. It's also popular with experienced pilots who are looking for a small, nimble, easy-to-maintain machine.

Like any popular machine, it's appreciated for its design and durability, but there's also room for improvement. The one area that I found needed work was the tail-rotor control. The stock system allows more play than is desirable where the tail boom is mounted to the mainframes. The stock setup uses a ball link so that the tail section can be removed for transport. Unfortunately, when the tail control is used, there's lateral movement at this ball link, and that makes the tail response sloppy.

The new setup is a basic cable system that's enclosed in an aluminum tube. It's easy to make, and the parts (see list) can be found at any well-stocked hobby shop.

CONSTRUCTION

First, install the plastic section of the Gold-N-Rod in the aluminum tube. Some plastic tubes are larger in diameter than others, so use one that slides easily through the aluminum tube. (Don't cut either to length at this point.) Next, prepare the two tail-link guides by drilling the guide holes out to 5/32 inch. Drill the hole in the horizontal fin brace, the hole in the body mount and the hole on the mainframe.

At this point, you should have removed the existing pushrods and the related hardware. Here's an easy way to install the tube:

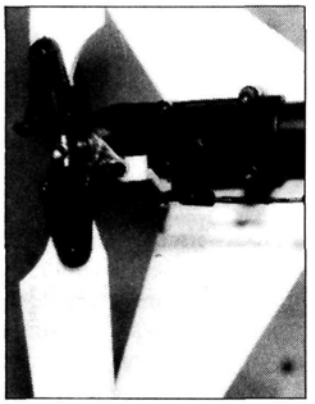
- Insert the front of the tube through the hole at the rear of the mainframe.
- Push the tube, and gently bend it until it's approximately 40mm from the servo wheel.
- Remove the tail boom and the horizontal fin. Slide one tail-link guide, the horizontal fin brace, then the other link guide onto the aluminum tube from the rear.
- Slide the tail-link guides over the tail boom as you re-install the tail boom. You'll have to make two more slight bends at the point where the tail boom

meets the mainframe. To allow free cable movement, make these bends as smooth as possible.

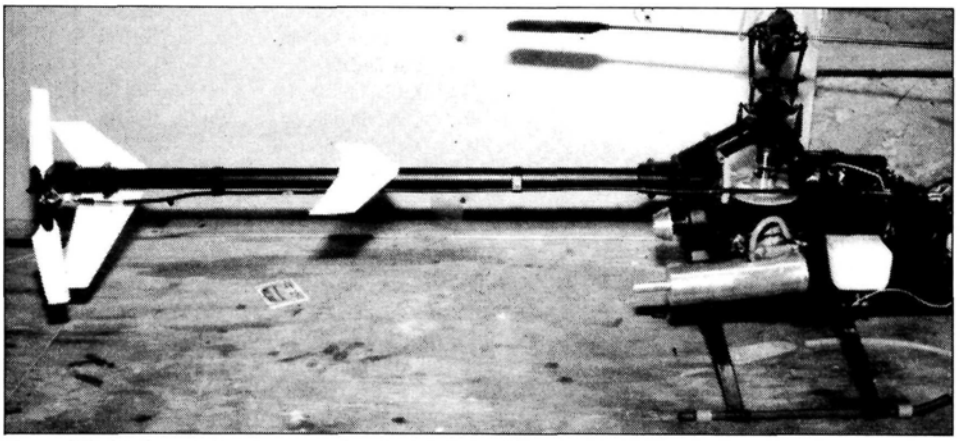
• Attach the tail boom and secure the bolts.

The Gold-N-Rods come complete with threaded couplers that must be soldered to the cable. Solder the front coupler on at this time. Thread a ball-link clevis onto the coupler (make sure the coupler has had enough time to cool), install the ball on the servo wheel, and snap-connect the ball-link clevis to the ball. Set the cable aside for now.

To cut the aluminum tube to length, first thread



In the modified system, ball links replace Z-bends; they're much more efficient and minimize end play.



The modified tail-control system uses Kyosho tail-link guides.

the remaining ball link onto the other threaded coupler, and then install the ball on the tail-pitch lever. Install the ball link over the ball, and hold it toward the front of the machine, parallel with the tail boom. With the tail-pitch lever at 90 degrees to the tail boom, cut the tube 15mm in front of the end of the threaded coupler. This gives the cable enough support while giving it ample travel.

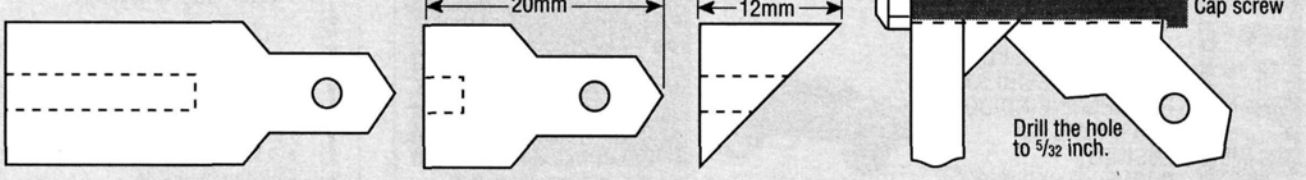
A support standoff (body mount) is needed toward the front of the tube near the servo, to give the proper standoff from the frame. Cut the thinner end of the body mount (the end with the hole you drilled) off square at 20mm total length. Take the remaining piece, and cut it at 45 degrees (see illustration). This piece measures 12mm from the square cut to the long point of the angle. Glue the two pieces together as shown in the drawing, and drill the hole through the back to allow a mounting screw to pass through. Finally, slide the mount over the tube, and line it up with the front of the frame. Drill a hole in the frame, and mount the piece with a 2.5mm nut and bolt.

The final step is to install the cable. Slide the cable into the tube from the front, and install the ball link on the servo wheel. Make sure the servo is at neutral before cutting the cable. Hold the cable up next to the rear coupler

PARTS LIST

- **K&S* 36x5/32-inch aluminum tube no. 1110**
- **Sullivan's* 36-inch flexible cable Gold-N-Rod, no. 508**
- **A pack of Kyosho's Tail-Link Guides, no. H-3209**
- **Associated's* RC10 body mount, no. 6330**
- **Two ball links (any brand will work)**

Creating the standoff support on the helicopter frame section.



Standard Associated RC10 body mount, no. 6330

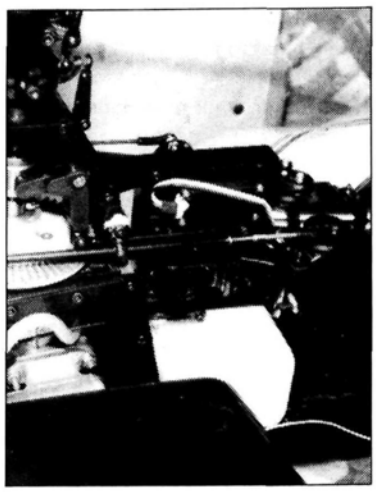
Cut the thinner end off square at 20mm.

Cut the remaining piece at a 45-degree angle

Glue the two pieces as shown.

Drill a hole in the back of the mount through which the mounting screw can pass.

Cable Tail Control



The modified system: note the ball link at the servo and the front frame stand-off that positions the cable linkage well away from the collective arm.

(make sure the pitch lever is still at 90 degrees), and cut the cable with enough left to be soldered into the coupler. Solder the coupler to the cable, and re-install the ball link. With the cable assembled, remove the ball link from the servo and manually move the cable back and forth. The cable should be very smooth, and it shouldn't bind at all. If the cable binds, check the bends and make sure that they're not too tight.

With this new system in place, your tail-rotor control will show a marked improvement over the stock system. I've found that it gives rock-steady control of all tail functions. As always, take your time, and double-check everything you use on your machine. Happy flying!

**Here are the addresses of the companies mentioned in this article:*
Kyosho, *distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.*
K&S Engineering, *6917 W. 59 St., Chicago, IL 60638.*
Sullivan Products, *1 North Haven St., P.O. Box 5166, Baltimore, MD 21224.*
Associated Electrics Inc., *3585 Cadillac Ave., Costa Mesa, CA 92626.* ■

Helicopter Challenge

The Pirouette—a precise dance

by CRAIG HATH

WELCOME BACK to another addition of "Heli Challenge." If I haven't taken the time in the past to say thank you for your interest and attention, I'd like to do so now. I genuinely appreciate the input that I get from all of you; keep it up.

Last month, I worked on nose-on hovering and some of the finer details associated with this difficult maneuver. I promised to discuss some fine-tuning and trimming techniques that were intended to wrap up this series on flying, but it occurred to me that some coverage of another area of flying was still in order. Let's take a look at one last aspect of flying: the pirouette.

THE PIROUETTE

This maneuver is truly distinct to the helicopter. No other flying craft that I'm aware of can hover in place while it spins about its center of yaw. Simply put, the helicopter sits in a hover and turns about its main mast. Once you get the hang of it, it's fun to practice.

Here are a few pointers:

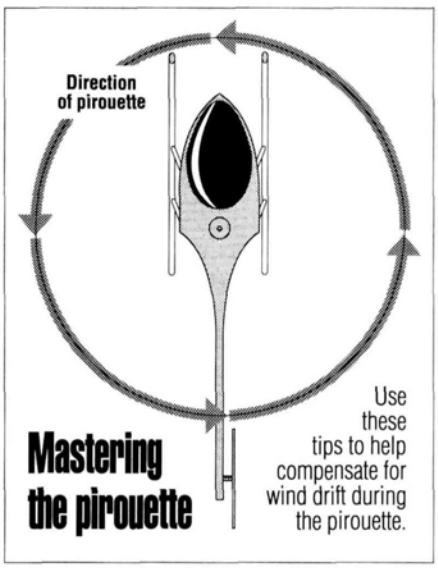
- Start with the helicopter off the ground at 10 to 12 feet, and be sure to pick a calm day. (I'll talk about the effects of wind later.)
- With the helicopter hovering as still as you can make it, add just a touch of tail-rotor pitch in either direction.
- Hold this tail-rotor input until the helicopter has completed a full 360-degree rotation about its yaw axis.

Sounds easy, right? At first, you may find it quite scary, and it may take a few attempts to get through it completely. Don't be intimidated by the task at hand. If you lose control, abort, and try again.

During your first attempts, completely let go of the pitch and roll cyclic control stick, and perform the maneuver with the tail rotor only. If your machine is well trimmed and there's very little wind, the helicopter will practically do the maneuver by itself! As you become comfortable with this, move the helicopter closer to the ground and practice more. Of course, you should consider the amount of tail-rotor pitch that you input for the pirouette, as this will determine the rate at which the machine spins.

The ultimate show of control is when the helicopter turns very slowly, which makes a great maneuver. A fast turn rate may look impressive, but it doesn't exercise your ability to control the machine.

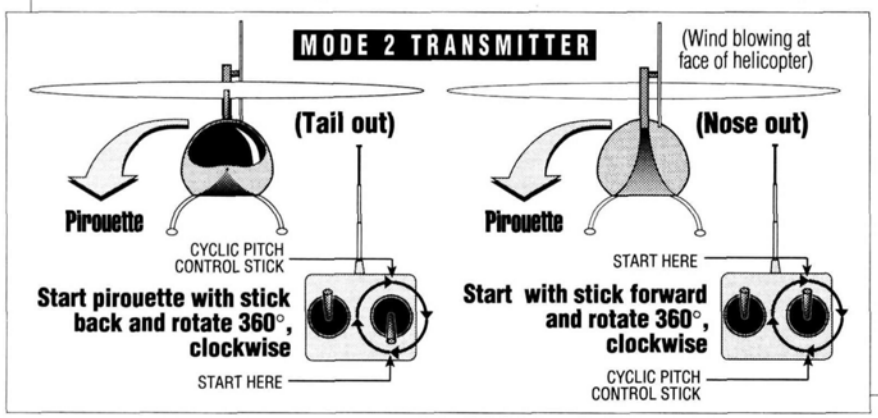
The direction of the turn is also important, since one direction will work *with* the engine's torque, and the other will work *against* it. In the pure, uncorrected form, a helicopter that has a clockwise main-rotor rotation will spin effortlessly to the left. (It may, in fact, climb as some drag is reduced, and the tail-rotor pitch is decreased.) Turning the helicopter to the right will put a greater load on the engine and the drive train, and this will cause the helicopter to sink slightly.



FLYING IN THE WIND

Flying a slow pirouette in the wind is a great way to hone your advanced flying skills. To prepare for competition flying, I incorporated a combination of several pirouettes in either direction into my practice routine. I begin a pirouette nose out, turned left, and let the helicopter spin several times in that direction as slowly as possible. Then I stop, go the other way and reverse to nose-on, etc. At the same time, I work on holding the helicopter in one spot and at one altitude.

It may sound crazy, but I really looked forward to practicing these maneuvers in a lot of wind. As I practiced, however, I began to realize that there was a simpler way



to maintain control of the helicopter and keep it in one spot. As the wind pushes back on the helicopter during the pirouette, the rotor disk tends to tilt up into the breeze. I found that by continually tilting the rotor disk into the breeze, the helicopter would stay put.

Let's take a quick look at the wind pushing on the rotor disk as the helicopter pirouettes. Start with the nose pointed into the wind at hover, and hold a little of forward cyclic to keep the helicopter still. As the tail-rotor pitch is reduced (you're doing a pirouette to the left here), the nose moves counterclockwise to the left, and the wind is now pushing on the right front of the helicopter. As the helicopter continues to turn counterclockwise, the full right side will be exposed to the wind; then the right rear, tail, left tail, left side, etc., will be exposed until the nose returns to facing straight into the wind. If you hold a little cyclic-pitch control in the proper direction at all times, the helicopter will stay in the same spot. (It really depends on the strength of wind and the machine's setup.)

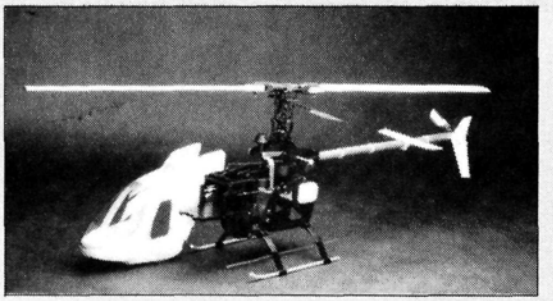
You can predict the direction of the control input needed just ahead of time by beginning to rotate the cyclic-pitch control stick in the direction that's opposite to the helicopter's rotation. This means that as the helicopter turns counterclockwise, a little fore and right cyclic will be needed. Blend this into right cyclic pitch only, then right and aft cyclic, through left and aft cyclic, and left cyclic only to left and forward cyclic, back to forward cyclic pitch only at the end of the maneuver. Confused? Simply put, you can rotate the cyclic-pitch control (right transmitter control stick, Mode 2 fliers; the single stick for single-stick transmitters; sorry, this doesn't work at all for Mode 1) in the opposite direction of the rotation of the helicopter at the same rate as the rate of rotation, and the helicopter will tend to stay in just about the same spot.

This always works, whether or not you start nose-in or nose-out. The key is to start with the stick at the correct position, and rotate from there, e.g., nose-on, tail into the wind. You'll be holding a slight amount of back cyclic; as the helicopter rotates clockwise, the cyclic stick will be rotated counterclockwise, and so on. Think about this for a while, and it may make sense; it does for me. The main idea is to get the timing and direction of movement right at the start, and the rest will fall into place.

One more thing about pirouettes: as mentioned earlier, be prepared to compensate for the changes in power requirements as you work through the maneuver. You'll have to add to or subtract from the power setting as you go, so you start and finish at the same altitude. My JR PCM-10 radio has a mixer that automatically compensates for this when it's properly adjusted. Boy, it sure is neat to have the right tools! If you don't have this luxury, you'll have to compensate manually.

Next month, I'll finish the series on precision flying. See you there. ■

ROTARY-WING ROUNDUP



INDY R/C
Lion Helicat

The Lion Helicat is a new 32- to .46-powered R/C helicopter that's excellent for beginners and experts who enjoy fun flying and performance flying. As a result of nearly three years of research and development, this new model features an entirely new structural design and strong, yet light, modern materials. It has autorotation; a dual ball-bearing, metal, tail-rotor grip; a pre-adjusted, balanced, tail-rotor blade; separate power and control systems; and electric- and pull-starter options.

Price: $399.95 (limited-time offer: $249.95)

For more information, contact Indy R/C Sales, Inc., 10620 N. College Ave., Indianapolis, IN 46280; (800) 338-4639 or (317) 846-0766.

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VORTEX R/C HELICOPTERS
New TSK Five Star 30V

The TSK family now includes a new 30-class R/C helicopter. This high-grade precision product is for intermediate and advanced fliers. All drive units and linkage systems are made of metal. In addition, a fully machined rotor head offers quick response for full aerobatic flight and precise, smooth, FAI-type hovering maneuvers. This machine features an all-metal rotor-head assembly; an all-metal, box-type mainframe and servo-tray set; a new, in-line, hex-starter clutch system; a precision tail-drive transmission (D-85); new, tail-rotor grips and blades; and a fiberglass 30V Super Body.

Price: $749.95

For more information, contact Vortex R/C Helicopters, 1374 Logan Ave., Costa Mesa, CA 92626; (714) 751-6212.

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FUTABA
7UHFS/Helicopter Super System

Futaba's new FP-7UHFS, 7-channel FM helicopter system includes an R128DF/FM receiver, four S5101 servos and a 1000mAh Ni-Cd power pack. This radio features four-model memory with helicopter, glider and aircraft software; an LCD screen; dual rates; programmable mixing; CCPM mix; idle-up; a timer; invert; servo-reversing; and a plug-in RF-module trainer system. It's available on 50 and 72MHz.

Part nos. T7UHFS (transmitter); R128DF (receiver); S5101 (four servos).

For more information, see your local dealer, or contact Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

PRODUCT NEWS

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Model Airplane News, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Model Airplane News.

TOP GUN AIRCRAFT
Ultra Eagle F-15 Ducted Fan Kit

Designed with the field flier in mind, Top Gun's sport-scale Ultra Eagle F-15 fills the gap between ducted-fan trainers and complicated, scale, ducted-fan kits. The Ultra Eagle can take off from short grass fields smoothly, powerfully and predictably. It's fully maneuverable in all flight modes, and its slow-flight stability makes landings and touch-and-go's easy. You can remove the Ultra Eagle's engine and radio components quickly.

Price: $299

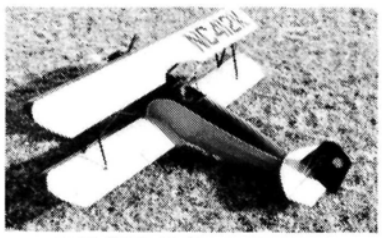
For more information, contact Top Gun Aircraft, 801 Canal St., Ottawa, IL 61350; (815) 433-2013.

VARSANE PRODUCTS
VP-22SG Oscillating Pump

Varsane's new VP-22SG oscillating pump for 2- *and* 4-stroke engines can be used with smoke systems and gas and diesel fuels. In a smoke-system application, you must install a VP-2CV check valve between the pump and the muffler.

Prices: $34.95 (pump); $5.50 (check valve).

For more information, contact Varsane Products, 546 S. Pacific St., Suite C-101, San Marcos, CA 92069; (619) 591-4228.



AERODROME MODELS
1930 Fleet Bipe

Aerodrome Models now offers a three-hour construction videotape for its 1930 Fleet Bipe kit. If you want to step up in building, but are concerned about your ability, this kit is for you. It comes with hardware, a heavy-duty fiberglass cowl and dummy cylinders. The 61-inch-span Fleet flies with a .65 to .90 4-stroke engine.

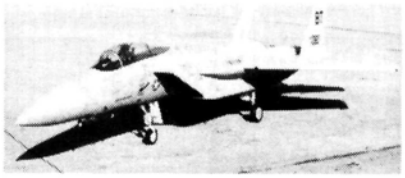
For more information, contact Aerodrome Models, 2623 S. Miller Rd., Saginaw, MI 48603; (517) 781-3000.

GLEN TORRANCE MODELS
WW I Dry-Transfer Decals

These scale dry-transfer decals are exact replicas of WW I aircraft markings and graphics. Currently available are 1/4- and 1/3-scale axial propeller decals, a 1/4-scale Fokker DRI manufacturer's plate and 1/4-scale German "werke" and serial numbers. Custom WW I transfers can be bought individually.

Prices: $4.80 each, or $9.30/pair (axial decals); $1.80 each (Fokker decal).

For more information, contact Glenn Torrance Models, 2981 Vail Valley Ct., Snellville, GA 30278; (404) 985-4543.



JET HANGAR
F-15C

Jet Hangar Hobbies has released this "Americanized" version of Philip Avonds' 1/9-scale F-15C Eagle. This kit includes an epoxy/glass fuselage, fiberglass liners and separate landing-gear doors, a clear canopy, a foam wing, a stab and dorsal cores, and detailed plans and instructions. Designed for twin Turbax Is and K&B 9101s, this 86-inch-long plane with a 56 1/2-inch wingspan is a two-time FAI World Scale Champion.

Price: $800

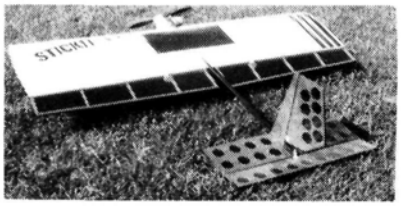
For more information contact Jet Hangar Hobbies, Inc., 12130G Carson St., Hawaiian Gardens, CA 90715; (213) 429-1244.

HIGH SKY
Glow Plug Idle Module

High Sky's Acoustic Glow Plug Idle Module (AGIM) uses a built-in microphone to monitor the engine, and whenever the engine runs too slowly, the module starts the glow plug to prevent the engine from stalling. The AGIM doesn't interface with the radio, so it doesn't need a microswitch or a servo linkage. It's easy to install, and all it needs is a 1.2V cell.

Price: $34.95

For more information, contact High Sky, 3929 Kansas St. #9, San Diego, CA 92104; (619) 297-5792.



AIR FLAIR
Stickit IV

Dan Stevens' renowned competition fun-fly airplane—Stickit IV—is now available in a kit! Packaged with Air Flair quality, this 3- to 3.25-pound plane has a 770-square-inch wing area with an incredible wing loading of 9.5 ounces per square foot. It's extremely maneuverable (4-foot-diameter loops), and its roll rate must be seen to be believed.

For more information, contact Air Flair, P.O. Box 2075 Fairborn, OH 45324; (513) 878-7487.

GRAUPNER
SB-13 Flying Wing

Graupner introduces its new 84-inch-span electric sailplane—the SB-13 Flying Wing! Based on the full-scale sailplane from the German company Akaflieg Braunschweig, the SB-13 is suitable for slope soaring, electric flight, or high-start launches, and you can build it quickly. This plane and dozens of other new items are featured in Hobby Lobby's new Catalog 18, which is free in the U.S.!

Price: $299

For more information, contact Hobby Lobby, 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444.

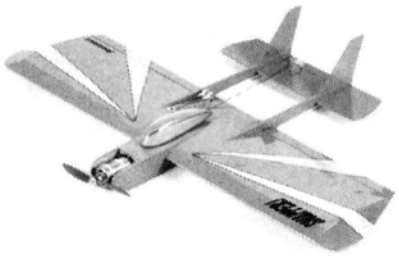
GLOBAL HOBBY DISTRIBUTORS
EZ Sports Aviation P-51B Mustang 40

Introducing the new, unique EZ ARF P-51B Mustang 40. This 55 1/2-inch-span "razor-back" model with a 542-square-inch wing area brings back all the glory of the Mustang's stunning WW II years, and you can easily be its pilot! EZ ARFs are 90-percent ready to fly. They have fuelproof firewalls, and their carefully formed and trimmed cowls and canopies fit perfectly! You'll find everything except the engine and the radio right in the box! The model requires a .40 to .45 2-stroke or a .60 to .90 4-stroke engine and a 4- or 5-channel radio. Optional retracts and armament (not shown) are also available.

Prices: $360 (Mustang); $44.95 (retracts); $48.95 (armament).

Part nos. 101034; 101091; 101102.

For more information, contact Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728; (714) 963-0133.

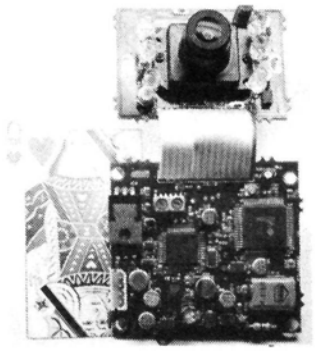


AEROCRAFT
Snapper Airplane

Aerocraft introduces the Snapper—a compact, twin-boom, high-performance gas or electric airplane. Its airfoil allows a wide speed range, solid tracking and good aerobatics. It weighs 22 to 36 ounces (depending on power used), has a 34-inch wingspan and can be assembled quickly.

Price: $49.95

For more information, contact your local hobby dealer, or Aerocraft, P.O. Box 553, East Northport, NY 11731.

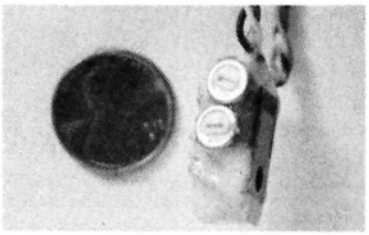


MODEL TRONICS, INC.
Micro Speed Controller

The Electro System Micro Speed Controller weighs approximately 1/3 ounce. You can adjust it to work with most radio systems, and it has proportional control and a BEC that guards your reserve power. A unique wiring setup enables you to mount this controller anywhere you want. For $1, Model Tronics also offers a catalogue with information on three revolutionary electric models.

Price: $87.50 (Electro System without connectors)

For more information, contact Model Tronics, Inc., 3824-24th Ave. West, Seattle, WA 98199.



SUPERCIRCUITS
PC-2ex Video Camera

Supercircuits' PC-2ex low-cost, monochrome, micro video camera weighs only 2.2 ounces and it measures approximately 2x2x2 inches. The PC-2ex runs on 9 to 13 volts and draws 95 milliamps. Its resolution is 240 lines horizontal, and its light capacity of 2 to 80,000 lux is metered by an auto-iris exposure system. Equipped with a removable infrared light source, the camera comes with a wide-angle, multi-element f2.0 lens, a six-month warranty and a money-back guarantee.

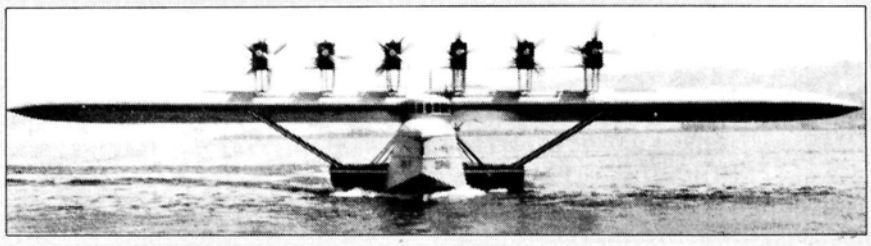
Price: $196.95 (plus $6.50 S&H)

For more information, contact Supercircuits, 1403 Bayview Dr., Hermosa Beach, CA 90254; (213) 372-9166.

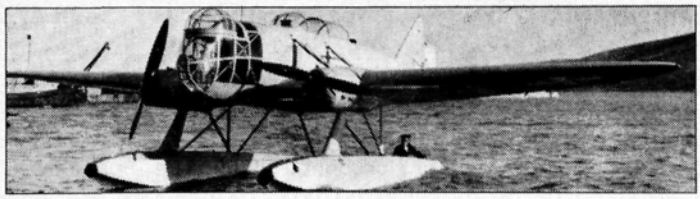
NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to Model Airplane News, **Name that Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Earl Lock of Tallmadge, OH, for identifying the July '91 mystery plane. The Yugoslavian Rogojarsky SIM-XIV-H was a twin-engine observation seaplane that was powered by two 200- to 240hp Argus air-cooled V8s that were mounted inverted. The semi-cantilevered monoplane had a rigidly braced center section with fully cantilevered outer panels. The entire wing was wooden, as was the oval monocoque fuselage, and both were covered with a smooth plywood skin. The plane was 36 feet, 5 inches long and had a 49-foot,10-inch wingspan. It carried a three-man crew, and in the nose, there was an observation position that had a rotating gun turret and navigation equipment. The cockpits for the pilot and rear gunner were in tandem over the wing and each had a sliding cupola. The aircraft sat on American Edo light metal floats that were mounted on the wings and fuselage with streamlined steel tube struts. No interconnecting spreader bars were used. We have no details of armament and other equipment.



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

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SEND AD AND PAYMENT TO: CLASSIFIED ADS, MAN, 251 Danbury Rd., Wilton, CT 06897 ATTN: Laura Kidder

BERKELEY, CLEVELAND, ETC., replica kits, duration rockets for jet models. Send three stamps to: WILLAIRCO, 2711 Piedmont Rd. NE, Atlanta, GA 30305.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

1930s to 1950s MODEL AIRPLANE MAGAZINES; 1930s aviation pulps, complete and good condition; $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

EMBROIDERED EMBLEMS, enamel pins. Your design; excellent quality; free booklet. A.T. Patch Co., Dept. 68, P.O. Box 682, Littleton, NH 03561. Tel.: (603) 444-3423.

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FLOATING AROUND

(Continued from page 106)

***Gee Bee**, 143 E. Main St., Chicopee, MA 01020.*
***Carl Goldberg Models**, 4734 W. Chicago Ave., Chicago, IL 60651.*
***MonoKote**; distributed by Great Planes Model Distributors.*
***Sullivan Products**, 1421 2nd St., Calistoga, CA 94515.*
***Rev-Up**; distributed by Progress Mfg. Co., P.O. Box 1306, Manhattan, KS 66502.*
***Formula-U**, distributed by Pactra Inc., 620 Buckbee St., Rockford, IL 61104.*
***Unionville Hobbies**, P.O. Box 135, Markham, Ontario, L3P 3J5 Canada*
***Quadra-Aerrow Inc.**, P.O. Box 183, Perth, Ontario, K7H 3E3 Canada.*
***A & M Associates**, 2727 N. Central Ave., Phoenix, AZ 85036.*
***Futaba Corp.**, 4 Studebaker, Irvine, CA 92718.* ■

LANIER STINGER

(Continued from page 72)

The cable system is made out of U-control cables that run through Nyrods for support. By moving the rudder servo, I saved about 5 ounces of weight in the tail of the model. Installation of the horizontal surfaces came out perfectly, as sent from the factory, without shimming or trimming of the wing or tail-surface saddle area.

After securing the vertical stabilizer, I installed the ABS turtle deck with PFM adhesive. A balance check indicated that the engine had to be mounted as far forward as possible. I had to stand the engine off the firewall with two pieces of 2x4 lumber that I laminated together and mounted to the firewall with PFM. This serves as a vibration damper and puts the engine exactly where I want it. The total time spent on construction had now reached nine hours.

LANIER STINGER

COVERING AND PAINTING

I covered the wing and the remaining exposed wood with Solartex and, after securing the landing gear to the fuselage and gluing the wheel-pant halves together, I painted the entire airframe with Ditzler Deltron—an acrylic urethane for automotive use. The catalyzed paint is fuelproof against 100-percent nitromethane, and it covers in one coat, although two are recommended for good gloss and color holdout. Since it contains polyisocyanate, use it only in a well-ventilated area while wearing a carbon-filter respirator. Alternatively, you could cover the model in MonoKote* or another suitable material and skip the painting part.

After installing the radio and fuel tank, etc., I checked the CG location and discovered that the Stinger needed more nose weight—almost 2 pounds to get it to balance properly for an all-up weight of 16 pounds.

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LANIER STINGER

(Continued from page 135)

PERFORMANCE

The Stinger's very light wing loading enables it to perform excellent short-field takeoffs and landings. The model "flew off of the board" with very minor trim adjustments. I half expected it to be a docile flier, but though it's definitely a pussycat to fly, it's fully aerobatic, performing clean snap rolls, aileron rolls, loops, inverted flight (with very little down-stick) and one of the most beautiful stall turns I've ever seen. The large rudder area allows the model to pivot around the CG cleanly and with little effort.

The Stinger flies equally well in windy or calm weather, and its tendency to "weathervane" in crosswinds is easily compensated for by rudder control. As with any model that has a large-diameter propeller (in my case, an 18x8 Zinger*), a little right-rudder is needed at the beginning of the takeoff roll until the tail comes up.

Landing is a breeze and requires very little control input from the pilot. As a matter of fact, simply letting go of the controls as you "cross the numbers" makes for a beautiful two-point landing. The light wing loading allows the model to fly well at very low speeds with total control on all surfaces. Unlike a lot of large-scale aircraft, coupling of rudder and elevator isn't needed. The Stinger can be flown in the "bank-and-yank" manner used by most pilots, and I haven't seen any sign of tip stalling. This is an excellent model for novice giant-scale enthusiasts or "hot-doggers."

Is it "awesome"? The word I'd use to describe it is *"outstanding"!* If you live at a higher elevation, this lightly loaded model should perform very well for you.

**Here are the addresses of the companies mentioned in this article:*
Lanier RC, *P.O. Box 458, Oakwood Rd., Oakwood, GA 30566.*
Innovative Model Products, *P.O. Box 4365, Margate, FL 33063.*
Zenoah; *distributed by ISC International, P. O. Box 40116, Indianapolis, IN 46240.*
Webra; *distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826.*
MonoKote; *distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61824.*
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